Chapter 2

Porcelain
The manufacturing of porcelain continued for almost 800 years. It was a prestigious ware admired by nobles, royals and king. Its demand was high and so the price. This is one of the main reasons why Chinese potters kept on manufacturing porcelain of different varieties and types. Since the beginning of porcelain manufacturing, the prime aim of Chinese potters were to fulfill the demand and needs of different buyers both in China and outside. The foreign buyers always prefer unique things and this is why the Chinese potters made exquisite varieties of porcelain. In this quest of acquiring perfection and accomplishing demands, large kilns were developed which could produce huge quantities of porcelain in less time.

This chapter includes the details about the production of porcelain and its development. It includes types and varieties of Chinese porcelain and its technological advancement, preparation of the raw materials, manufacturing techniques, kiln sites, colour pigmentation, types of glazes, firing temperatures, shapes and sizes, varieties of painting and decoration, and inscriptions.

Types and Varieties

For many years it was believed that the discoveries of porcellaneous ware from the Han tombs of the Shensi are the earliest evidence of Chinese porcelain. These wares shaped in the form of globular jars had coating of thick and lustrous porcellaneous glaze in greenish-yellow tinge. But the investigations proved that these Han period’s wares are the prototypes of porcelain and represent one of the initial or primitive stages of development through which porcelain must have passed before it could reach at the stage of perfection in the T’ang period (618-906 CE) (Laufer 1917: 176-177).

Porcelain, a highly refined white ceramic originated in late 8th or early 9th century CE during the T’ang period. It developed in numerous types during different successive periods of Song, Yuan, Ming and Ch’ing. The types of porcelain prepared in different eras show the distinct styles and patterns. The early white porcelains had entirely different shapes and sizes. They were made in the shapes of globular jars with incised
designs, small bowls, dishes with carved, incised and mould impressed designs, etc.

During the Song period (960-1279 CE), new varieties of porcelain, Ch’ing pai/Qingbai, Ding/Ting white porcelain, etc. were developed. In the Yuan period (1280-1368 CE), the blue-and-white porcelain variety was originated which was also known as export ware. This variety was different from the earlier ones in style, decoration and shapes. It became especially popular among the kings in Southeast Asia, Near East, South Asia and Europe.

After overthrowing the Yuan dynasty, a new dynasty, Ming appeared in 1368 CE who continued their rule till 1644 CE. Initially the Ming rulers were not in favour of the export of porcelain therefore they banned overseas exports. But porcelain for the local market and the use of Chinese emperors continued to be manufactured. A number of varieties originated during this period which includes red-and-white porcelain, red-and-green porcelain, over-glaze enamelled porcelain, green-and-yellow porcelain, etc. Different types of blue-and-white porcelain variety developed during the 15th-16th century CE which included Kraakporselein, Swatow ware, etc. The old varieties such as, white porcelain, celadon ware continued to be manufactured.

During the 17th century, Ch’ing dynasty captured China and continued to rule up to 1911 CE. The Ch’ing rulers favoured manufacturing of porcelain and the varieties produced during the Ming dynasty continued. The variety of blue-and-white porcelain gradually declined as the over-glaze enamel porcelain became more popular. The production of over-glaze enamel varieties like famille rose with soft pinkish surface, and famille verte increased during this period. The porcelain industry of China started declining during the 18th century CE when Johann Friedrich Bottger, an alchemist, accidently discovered the composition of porcelain. As a result, in Europe, a porcelain manufactory was set-up in Meissen. The secret of porcelain manufacturing was further disclosed after T’ang Ying, a Chinese official at Jingdezhen kiln described twenty steps of its manufacturing. Similarly, Pére d’entrecolle, a French Jesuit, visited the kilns of Jingdezhen in China and studied steps involved in the production of porcelain. Thereafter, the porcelain industry of China declined.
The study of porcelain types and varieties highlights its origin, advancement and decline.

**T’ang Period (618-906 CE)**

Porcelain, a shiny and transparent ceramic originated during this period. An important reference of porcelain comes in the 9th century CE record of an Arab merchant, Sulayman, that mentioned “there is in China a very fine clay from which are made vases having the transparency of glass bottles; water in these vases is visible through them, yet they are made of clay” (Silcock 1939: 15). It shows the refinement and high quality of porcelain which was already gained in the T’ang period.

During this period three varieties of porcelain - white, celadon ware/ Yueh celadon, and blue-and-white were manufactured. Amongst these, information regarding the white porcelain and celadon were well known. The production of blue-and-white porcelain variety was first discovered in 1977 from the Yangzhou port of Jiangsu province. The blue-and-white porcelain was again discovered in 1983 from the same site. Prior to that, it was believed that the blue-and-white porcelain was manufactured during the Yuan period.

**White Porcelain**

The earliest porcelain of plain white variety was originated in T’ang period between late 8th and early 9th century CE (Medley 1976: 97). This white porcelain was compact, hard and much refined than the stoneware of earlier periods. The colourless glaze was applied or poured on the body of white porcelains that make them look glossy and shiny (Medley 1976: 100). The excess or thick application of glaze on porcelain leaves tear marks in yellow or brown colours that was regarded a sign of genuineness by the early Chinese collectors (Burton 1921: 10). The white wares of T’ang period equated the brightness and thinness of silver and also the decorative techniques such as carving, beading and ring punching (Vainker 1991: 67-68).
Famous kilns of T’ang period which produced white porcelain were found in Henan, Hebei, Shanxi and Anhui provinces. The best white porcelain was manufactured at Gongxian in Henan. Other than this, the two outstanding types of white porcelain found in Hebei region were Xing and Ding wares (Li 1996: 53). Both these wares had bright glazed bodies.

Gongxian White Porcelain

Gongxian is a district located in Henan province of north China. The present day Gongxian is an industrial city with factories of coal mining, bricks and cement manufacturing. Far away from the modern day factories, the ruins of the kilns of T’ang period have been found on the outskirts of Gongxian near the Rivers Huangye and Baiye (Wood 2007: 96). Geologically, this site is rich in limestone and fertile loess soil which made this site suitable for producing early white porcelain.

An analysis of porcelain from this site has shown that the material used for manufacturing it was aluminous secondary kaolin of variable alkali content (2-7% KNaO) (Wood 2007: 96). It was found that the content of alumina in the clay was high along with occasional high alkali. Therefore, the clay found at Gongxian was a natural mixture of kaolin and potassic mica with very little quartz and the glaze used on the porcelain was lime-alkali based in a ratio of 2:1, contents of which included 7-10% CaO (Calcia) and 3-5% KNaO (Potassia and soda) (Wood 2007: 96). The body of the Gongxian porcelain was of slightly cream tone. The common shapes found from here are bowls and jars.

Xing White Porcelain

The production of Xing porcelain was done in Lingchen county of Hebei province. It was one of the most famous varieties of porcelain of T’ang period. It was used by everyone in China whether rich or poor.

Analysis showed that Xing was a high-fired ware (temperature going up to 1350°C) and was lower in fluxes mainly the alkalis, Potassia and soda (Wood 2007: 98).
This ware had a white tone which was given by dipping the pieces in white clay slip before firing (fig. 2.1). The common shapes found were bowls, ewers, jars, etc. Generally the wares were made plain but for export purposes moulded designs were made on certain pieces.

Ding/ Ting White Porcelain

The production of Ding porcelain (fig. 2.2) began in T'ang period but it developed during the Song period when its use was accepted in the palaces by the Chinese emperors. The site for producing this ware was located at Beizhen and Nanzhen in Hebei. The early Ding porcelain was somewhat similar to Xing porcelain but the quality was slightly low. The common shapes found were bowls, jars and ewers.

Yueh Celadon

Yueh, the olive-green celadon wares were prepared at the kilns in Hunan. It was a highly admired type of porcelain in the T'ang court. The mention of Yueh celadon has been noticed in the Chinese historical record of Lu Yu in a text on tea, Cha jing (9th century CE). The text mentioned it as green as jade and tea appears green when poured in Yueh bowls (Vainker 1991: 68-69).

Decoration on this celadon variety includes under-glaze incised and carved designs for example lotus petals (Valenstein 1975: 58). The manufacturing of this ware along with the white porcelain continued in the period of five dynasties (906-960 CE).

Usually simple in shape, the wares include vases, bowls, dishes, boxes, etc. The decorations included natural forms of plants, clouds and birds, incised under the glaze (Vainker 1991: 71-72). More of bronze styles were copied on porcelain of this period such as five or six lobed rims (Li 1996: 56).
fig. 2.1 Hebei, China: Xing white porcelain, Vase (source: Ashmolean Museum, University of Oxford)

fig. 2.2 Hebei, China: Ding white porcelain, Bowl (source: Wood 2007: 99)
Blue-and-white Porcelain

In 1977 and 1983, the pieces of blue-and-white porcelain variety (fig. 2.3-2.4) were discovered from Yangzhou port, Jiangsu province (Li 1996: 53). The potsherds were manufactured at the kilns of Gongxian and had greyish body and greenish-white glaze with under-glaze blue paintings. Analysis of the potsherds showed that the wares were produced in oxidised conditions and glazed with lime and lime-alkali types (Wood 2007: 97). The cobalt pigment used was pure having only small traces of copper, iron and sulphur. The shapes of these potsherds resemble bowls and small dishes.

Song Period (960-1279 CE)

The trade activities increased during the Song period and so the varieties of porcelains. It was the period when sea-trade began and it was regarded more profitable and safer than the land route trade (Medley 1976: 103). The Song rulers understood the importance of trade and preferred exports of luxury items like silk and porcelain through sea-route. The northern China was a centre of porcelain manufacturing during the initial years of Song period. The outside attacks however forced them to move towards south China where the manufactories of porcelain laid during the 12th century CE.

Northern Kilns

The Song dynasty began to rule in the northern part of China in 960 CE and continued their control till 1127 CE. The northern kilns of China at this time became especially
famous for the ceramics and the period was regarded as the classic period (Vainker 1991: 88).

Ding/ Ting

The Ding ware is refined white porcelain which was first produced during the T’ang period (Hobson 1933: 260). In the Song period, these wares were either plain or decorated with incised, combed or carved designs which reflect high standards of the potters of Song period (fig. 2.5). Mould impressed designs were introduced during the Song period and were prolifically used for decorating this porcelain. Frequently found decorative motifs were dragons, phoenixes, ducks, lily, lotus and peony flowers, etc. (Hobson 1933: 265; Medley 1976: 112-113).

This ware had a thin, refined, hard and resonant white body which are essential qualities of porcelain. A rich ivory coloured glaze was used on Ding porcelain which characteristically runs into small streak and created tear marks (Valenstein 1975: 75-76).

Ding ware is distinct because of its firing technique. These wares were fired on their un-glazed rim that was just opposite to the regular technique where pots were fired on the base (fig. 2.6). Two advantages of firing bowls, dishes and plates on the rim were noticed by the potters of Song period. The first advantage was “by distributing the weight of the vessels evenly over a wider area, and the likelihood of warping during the initial drying out period in the kiln is slightly reduced, and the second was that a larger number of pieces can be fired in a single setting” (Medley 1976: 109). The saggars used for firing this porcelain were specifically designed with a series of steps to keep the pieces in increasing order i.e. from smaller to larger. After the firing process, the rim of some Ding wares were capped with metal bands (Hobson 1933: 265). Therefore, if an ivory-white porcelain bowl moulded with a design of flying phoenix surrounded by peony flowers was found with tear marks or drops of glaze and having an un-glazed rim covered with a metal band then it is clearly a Song period’s Ding porcelain specimen.
fig. 2.5 Ding white porcelain: Dish having incised decoration of ducks in a pond
(source: Medley 1976: 108)

fig. 2.6 Ding porcelain dishes kept upside down in the saggar (source: Medley 1976: 109)
Southern Kilns

The southern Song dynasty ruled over southern China from 1127-1279 CE. The ports, Guangzhou and Quanzhou in southern China became especially popular during this period and over fifty foreign countries were using them for the exchanging goods with China (Li 1996: 132). Export of porcelain along with other ceramic varieties was popular during the southern Song dynasty.

Lung-ch’úan (Longquan)

The production of Lung-ch’úan southern celadon (fig. 2.7) started in southern Chekiang, near River Hsi (earlier known as Li-shui) during Song period (Li 1996: 137). There were hundreds of kilns in Chekiang region and some were situated on high steep mountains amongst which the best known were Ch’i-k’ou, Ta-yao and Chin-ts’un (Medley 1976: 147). The kilns were of dragon type having interconnected chambers and could produce over 25,000 pieces in a single setting which shows the size of ceramic industry (Boqian and Shilun 1963: 27-35).

This variety of porcelain has whitish body with bright reddish exposed foot-bums on the base. It is the characteristic feature of southern celadon which distinguishes them from the northern type. The glaze has a smooth greyish-green or greyish-blue shine that feels like jade. The main reason of this effect over the glaze is a small amount of iron oxide and a reduction firing technique (Medley 1976: 147). The best quality of Lung-ch’úan wares had fine-grained, compact and greyish-white tone which was seen through the thin glaze (Valenstein 1975: 91).

The popular shapes in this type were mallet vase, wine jars, ewers, dishes, large basins, etc. Some shapes were inspired from bronzes as well which includes li tripod, kuei, tsun and ku (Medley 1976: 148).
Ch’ing-pai (Qingbai)

The name ch’ing-pai which means ‘clear white’ was found in the early Chinese literature. This porcelain variety was indigenous to southern China and the kilns of Jingdezhen were responsible for its large productions. A large number of ch’ing-pai finds have also been traced at the kilns in Fukien, Chekiang, Kwangtung, southern Anhwei and Yunnan provinces. This type was first appeared during T’ang period though in less refined form but it continued to be produced up till mid 14th century CE in refined quality (Valenstein 1975: 96).

The ch’ing-pai porcelain has a refined bluish-white or greenish-white translucent glaze (fig. 2.8). Its body was thin and quality of clay was extremely refined. The best ch’ing-pai porcelains had translucent white crystalline texture.

The decorative style on this variety has little resemblance with Ding and other northern and southern wares. Mould-impressed designs were preferred in Song period and were prolifically found on Ch’ing-pai. But designs such as a lotus scroll and motifs of ducks swimming in a pond as found on Ding wares were never found on Ch’ing-pai. Floral decorations done on Ch’ing-pai porcelain were systematically organised in three to four divisions inside a bowl along with dotted combing in between as a filler (Medley 1976: 167-168). The popular shapes were dishes, bowls, vases, ewers, gourds, etc.

Early in the 20th century dealers of Peking named it, ying-ch’ing (shadowy blue), because of the slightly bluish texture on the transparent glaze (Medley 1976: 165).

Yuan Period (1280-1368 CE)

In the 13th century CE a nomadic tribe of Mongols captured China and called themselves Yuan. They ruled over China from 1280 to 1368 CE. Under the Yuan rule
China became a strong nation again after a long period of disturbances and wars. The ceramic industry flourished as it developed through the ages. Varieties of porcelain such as blue-and-white, red-and-white, celadon, etc. were admired prolifically in foreign markets.

Ch'ing-pai (Qingbai)

The ch'ing-pai porcelain of Yuan period was a continued tradition of Song period’s bluish-toned glazed porcelain wares (fig. 2.9) Most of the ch'ing-pai wares during this time were made in the kilns of Jingdezhen but similar types were also prepared at Fukien and Kwangtung provinces of southern China (Valenstein 1975: 105).

A striking feature of ch'ing-pai wares was its extreme thinness which was obtained using fast wheel. But besides producing the thin wares, the manufacturing of less refined heavy wares also grew. The potteries were roughly thrown on the wheel and the shapes like jars or vases were made separately and then luted together to cover the joins (Medley 1976: 171-172).

Decorations found on ch'ing-pai during the Yuan period included motifs like lotus sprays, other floral scrolls, figures and birds which were freely incised, combed or carved. Some were also decorated with applied strings of pearl beading or twisted cord (Valenstein 1975: 104). The beaded string type design was often found with relief panels of floral designs. The designs of ch'ing-pai show a uniqueness and originality of the Chinese potters.

Shu-fu

The Shu-fu is a fine and hard variety of white porcelain which has opaque glaze of bluish-green tint. The wares of Shu-fu type are found to be heavily constructed and
generally left unglazed (Medley 1976: 174). In terms of decoration, the Shu-fu types have mould-impressed designs on inner side of the pottery along with occasionally found combed and incised designs on the outer side. The wares of this type is called Shu-fu (fig. 2.10) because of the inscription on the inner side in two relief characters shu and fu, interpreted as “Privy council” (Valenstein 1975: 105).

Mention of the Shu-fu wares have also been traced in a Chinese work of Ts’ao Chao (1388 CE). It mentioned that the Shu-fu wares ware made in the private kilns and supplied to the palace; the material had to be fine, white and unctuous clay, and thin specimens were preferred and inside them were written the characters shu and fu as a mark (Hobson 1915: 162).

The glaze on Shu-fu wares was developed and inspired from the ch’ing-pai wares. Shu-fu body and glaze was sometimes found close association with ch’ing-pai which are regarded as transitional types. The true Shu-fu type glaze on the other hand was found to be thick, opaque and having matt surface (Medley 1974: 29). If compared, it was found that the ch’ing-pai wares did not continue after mid 14th century CE while Shu-fu porcelains survived and continued to be manufactured till the end of 14th century CE (Valenstein 1975: 105).

Blue-and-white

The blue-and-white porcelain variety was the most admired and important of all the porcelains. It has a glossy white surface and decoration of cobalt blue over it. The ware is often called under-glaze blue-and-white porcelain as the decoration was done under the glaze on the biscuit form (leather-hard condition). The glaze is applied after painting and then the ware is heated above 1280°C.
The beauty and glossiness of this type made it popular especially in the Near East, Southeast Asia and South Asia. It is also believed that during the 13th century CE the cobalt blue decorations were already being used for decorating earthenware in Persia but the results were not as good as traced on porcelains (Medley 1976: 176). This type was mainly found having shapes of large dishes, bowls, jars, ewers, etc. as demanded by the Near Eastern buyers.

The blue-and-white porcelain variety was exclusively made for export purposes. On the basis of its shape, the variety is divided into two groups i.e. first group included open forms of plates, dishes and bowls and the second group consisted closed forms of vases in *mei’ping* (pear shaped vases), *guan/ kuan* (globular shaped vases) and ewers.

In the first group, the plates and dishes are of two types. The first type inspired by near-eastern metalwork is earlier in date and has flattened foliated rim, deep cavetto and unglazed base (fig. 2.11). This type is not only found in blue-and-white but also appears in lung-ch’uan ware. The diameter of dishes of this type vary in between 38 to 46 cm (Medley 1976: 178).

This type was made using two moulds that were designed to fit together when the porcelain clay was pressed in between. The inside mould had designs of decorative motifs commonly peony scrolls on the cavetto or narrow chrysanthemum scroll on the rim. Clay was first kept inside the moulds and pressed hard. The clay is taken out from the moulds when it takes the desired shape. The base was shaved and the foot-ring cut before the piece was passed on for drying in preparation for the painting. Then the designs were made in the centre using cobalt blue, the relief portions were usually left white. The decorative motifs on this type was more Chinese in inspiration which included plant and flowers such as peony, chrysanthemum, camellia, gardenia, lotus, morning glory, blackberry lily, etc; birds such as phoenix, heron, peacock and pheasants; animals such as deer, *kylin*, dragon, lion; and Buddhist, Taoist and other auspicious elements (Medley 1976: 180).

The second type of dishes and plates in the group have flattened rim with no foliation (fig. 2.12). The dimensions of this type are same as the foliated rim dishes and plates.
fig. 2.11  Blue-and-white porcelain: Dish with foliated rim
(source: British Museum, London)

fig. 2.12  Blue-and-white porcelain: Dish with flattened rim
(source: Ashmolean Museum, University of Oxford)
This type was originated later in about 1350 CE (Medley 1976: 179). These were made using fast wheel and template but the foot-rings were cut and shaped separately. As the first type, the decorations were done using cobalt blue and the entire dish or plate was covered with designs of different Chinese motifs. Some of the decorative motifs were based on Islamic metalwork (Medley 1972: 1-10).

The second group includes vases in different shapes (fig. 2.13). The mei’ping vase was pear-shaped with a small mouth, wide shoulder and tall body. The guan vase was globular and had either a tall ovoid shape and a small neck or a wide mouth but shorter body. The ewers were found in mei’ping form but had a spout and a handle. Different parts of the ewers were made separately on wheel and then joined together sometimes using moulds. A variety of designs were used for decorating these forms such as scenes from the wars, historical stories, sceneries, landscapes, etc.

![fig. 2.13 Blue-and-white porcelain: Meiping vase, guan jar, stem-cups](source: British Museum, London)

Red-and-white

The under-glaze red-and-white porcelains of Yuan period had resemblance with the blue-and-white porcelains in decoration, shape and fabric. The copper pigment for the red colour on the white base was difficult to control and sometimes turned into muddy or reddish-gray tones (Valenstein 1975: 113). This variety was made for the local Chinese market and shows similar motifs specifically floral motifs as found on blue-and-white porcelain variety.
Lung-ch’uan (Longquan)

The lung-ch’uan celadon (fig. 2.14) was originated during Song period and it continued to be made during the Yuan period. The lung-ch’uan of this period had glaze tones of bluish-green or olive. This variety was found to be heavily decorated with old techniques of incising, carving and under-glaze reliefs (Valenstein 1975: 118-119). The major kiln centres of this variety were at Jingdezhen. The ware was equally appreciated as blue-and-white porcelains as both were quite similar in shape and size. These were also made in large sizes and were heavily potted. Some shapes though were also made smaller and lighter.

Ming Period (1368-1644 CE)

Ming was one of the longest periods in the history of China. The first emperor of Ming dynasty was Chu Yuan-chang of Hung-wu reign who ruled in China from 1368 to 1398 CE. He was completely against the trade with the outside world (Vainker 1991: 140). As a result he changed the free trade policies of China and banned all the overseas activities which directly affected the production of export porcelain. During his period the red-and-white porcelain similar in design as blue-and-white porcelain became popular which was mainly used by Chinese (fig. 2.15). His accession was followed by emperor Huei-ti (Chien-wen) who ruled over China for a short period from 1399 to 1402 CE. During Chien-wen reign also production of porcelain could not progress. Therefore, the export of porcelain declined between 1368 to 1402 CE.
Porcelain for the use in palaces and local people continued to be manufactured on small scale. It was in 1403 CE, when the porcelain trade resumed by the Ming emperor Ch'eng-tsu of Yung-lo reign. After it, throughout the Ming period, different varieties of porcelain continued to be manufactured for both overseas and local markets. The porcelain made during this period was recognised in the Western countries which gave a new turn to the export of porcelain. During the Ming period, the kilns of Jingdezhen climbed new heights when it became imperial kiln site by overshadowing other kilns of China (Valenstein 1975: 127). Some kilns though in the north like Jun, Ding/Ting and Cizhou of Hebei-Honan region and Longquan and Dehua in south China continued to manufacture porcelains for domestic and overseas markets (Li 1996: 208). Blue-and-white porcelain variety remained in high demand during the Ming period. Modification in the style and designs were noticed on blue-and-white as rulers changed.

Yung-lo Reign (1403-1424 CE)

Yung-lo was the famous Chinese emperor who resumed foreign trade policies of China. During his reign, Zheng He, a navel commandant was sent on seven maritime missions to different countries between 1405 to 1431 CE (Li 1996: 207).

Blue-and-white

The porcelain of this period was made at the imperial factories. Blue-and-white variety was decorated with su-ma-li blue and the base of these wares had white colour with palm-leaf spots (fig. 2.16) (Bushell 1910: 56-57).

During the Yung-lo period, the tradition of painting reign title of emperors known as nien-hao mark was started, but a few pieces had this marking (Valenstein 1975: 129). Porcelain of this period was thick both in the shape and fabric (Bushell 1910: 57).
Monochromes

The monochromes of Yung-lo period were inspired by the blue-and-white porcelains in shapes, sizes and designs. The designs on blue-and-white porcelains were copied on monochromes by incising or relief mouldings under clear glazes. Some of these wares had thin and refined white bodies and Yung-lo reign mark in archaic characters while some pieces had an-hua (secret or hidden decoration) which was only visible under bright light (Valenstein 1975: 130).

Hsuan-te Reign (1426-1435 CE)

After the end of Yung-lo reign, the new emperor namely Jen-tsung of Hung-hsi reign ruled over China for one year only in 1425 CE. The porcelain of Hung-hsi was similar to the ones produced during the Yung-lo reign. In 1426 CE, certain changes were noticed on porcelain of Hsuan-te reign in the form of decoration and colours.

Blue-and-white

The blue-and-white porcelain of Hsuan-te was made of fine and thick material and had no visible orange-peel markings on the surface (fig. 2.17). The pieces of this period had crackled glaze and decorations of fine dragons and phoenixes along with the reign mark, Ta Ming Hsuan-te nien chih (made in the reign of Hsuan-te of the great Ming dynasty) (Bushell 1910: 58). The Hsuan-te porcelain was so popular that it was copied in later period also including the use of reign mark of this period.

Red-and-white

The red copper colour under the glaze was comparatively difficult to control for Chinese potters and therefore it was replaced by other manageable decorative techniques. Only a few pieces of red-and-white ware marked with Hsuan-te mark are genuine and reliable (Valenstein 1975: 136).

Monochromes

This period became especially popular for the monochrome porcelains (fig. 2.18). Different types of monochromes, thin and heavy covered in white or copper-red or
fig. 2.17 Hsuan-te blue-and-white porcelain: Vase
(source: Ashmolean Museum, University of Oxford)

fig. 2.18 Hsuan-te deep red monochrome porcelain: Dish (obverse and reverse)
(source: British Museum, London)
cobalt-blue glazes were particularly appreciated. These types also had reign mark and a few copper-red glazed wares had *an-hua* (secret or hidden decorations) of incised clouds and dragons (Valenstein 1975: 137-138).

Over-glaze Enamels

The art of adding enamels over the glazed porcelains was known to Tz’u Chou potters in the end of 12th century CE but it developed on a full scale during Hsuan-te period in the kilns of Jingdezhen. Such wares were double fired, first the firing was done after applying the paintings in blue or red under the glaze and the second firing was done at a low temperature after the application of enamels over the glaze (Valenstein 1975: 136). Different enamel colours were used over the glaze such as iron-red, yellow, etc.

Ceramic Interregnum (1435-1465 CE)

The period between 1435 and 1465 CE, ruled by three successive reigns, Cheng-t’ung (1436-1449 CE), Ching-t’ai (1450-1457 CE) and T’ien-shun (1458-1464 CE) is known as the period of Ceramic Interregnum (Valenstein 1975: 138). During this period it was found that porcelains were not authentically marked with Chinese inscriptions. There is also a lack of literary accounts on the Chinese ceramics of this period. Some experts on Chinese porcelain believe that the reign marks of Hsuan-te and the style of ceramics continued during this period.

Cheng-hua Reign (1465-1487 CE)

In 1465 CE, porcelain manufacturing touched new heights. The porcelains of Cheng-hua reign were prepared with precision and refinement. The glaze was smooth and having a cream coloured texture. It was made according to the taste of emperor Wan Kuei-fei.

Blue-and-white

The porcelains of Cheng-hua were carefully prepared which developed a smooth and deep mellow creamy coloured glaze. The heaped and piled effect as found in earlier blue-and-white porcelain was comparatively lesser in Cheng-hua
blue-and-white (Valenstein 1975: 139). Cheng-hua blue-and-white was as thin as a paper and the wares of this period were especially noteworthy because decorative motifs like floral scroll, butterflies, insects, etc. were particularly painted on perfume boxes, jars, shallow cups (Bushell 1910: 59).

Green-and-white

This type of green-and-white porcelain was a Cheng-hua period’s innovation (fig. 2.19). The technique was different in comparison with other porcelain types. A decorative incised design most commonly dragon was made in the leather hard form of porcelain, then the incised area is covered with a wax resist and thereafter glazing is done leaving the waxed areas. The pottery is fired after that and during the process of heating the wax vanishes turning the unglazed area into a buff colour. The incised buff colour area was then painted with green enamel and the pottery is again fired at low temperature (Valenstein 1975: 140).

Hung-chih Reign (1488-1505 CE)

In 1488 CE, the reign of Hung-chih started in which the production of porcelain remained flourishing as it was during the Ch’eng-hua reign. The porcelain varieties produced were similar with the ones blue-and-white and green-and-white porcelains of Ch’eng-hua.

Cheng-te Reign (1506-1521 CE)

The reign of Cheng-te was the last innovative period of Chinese porcelain advancement. After it the decline of porcelain manufacturing began and the designs
became unnatural and less refined.

Blue-and-white

The blue-and-white porcelain of Cheng-te showed a distinct feature from earlier blue-and-white (Valenstein 1975: 139). It was as thin as a paper and the wares of this period were especially noteworthy because decorative motifs like floral scroll, butterflies, insects, etc. were particularly painted on perfume boxes, jars, shallow cups (Bushell 1910: 59). These blue-and-whites had a grayish tone in cobalt blue and the glaze over the decoration had greenish tint. The shapes also showed changes as during Cheng-te period, the deep cup-like bowls became especially popular.

Another blue-and-white variety of porcelain was also found during this reign which was popularly called as “Muhammadan ware”. This variety had Arabic or Persian inscriptions along with the decorations of floral scrolls and formal borders (fig. 2.20). It is believed that Muhammadan wares were made for the Muslim eunuchs who exercised great power over the Cheng-te emperor (Valenstein 1975: 147).

Chia-ching Reign (1522-1566 CE)

The porcelains manufactured during the Chia-ching reign were less refined in quality as compared to earlier periods. The idea was to maximise the quantity which automatically decline the refinement of porcelains.

Blue-and-white

In Chia-ching blue-and-white, Muhammadan blue in rich purplish tone was used (Bushell 1910: 62). The decorations of this period reflected Taoist symbols and emblems. Some specially made pieces of blue-and-white for the European market was
decorated with Portuguese armorial emblems and Portuguese inscriptions along with the years in which they were made (Valenstein 1975: 151).

Wu-ts’ai (Wucai)

This type of porcelain was an important innovation of Chia-ching. The word Wu-ts’ai (fig. 2.21) stands for five coloured ware which was developed during the Ming period (Li 1996: 213). Different coloured enamels were found on Wu-ts’ai which included yellow, green, blue, red and black (Valenstein 1975: 152). These types are counted among the category of over-glaze polychrome enamels.

Lung-ch’ing Reign (1567-1572 CE)

The Lung-ch’ing style of porcelain was similar to Chia-ching. No drastic changes were noticed. The superficial scenes depicted on porcelain of Lung-ch’ing were not of artistic nature (Bushell 1910: 64).

Wan-li Reign (1573-1620 CE)

The Wan-li period showed some different varieties in porcelains amongst which blue-and-white was noteworthy. The blue-and-white produced for imperial use had beautiful ornamentations of landscape and nature scenes. Among the type of blue-and-white, a distinct type appeared known as Kraakporselein (fig. 2.22). It was named after the Dutch name for the Portuguese carracks i.e. merchant ships which originally brought them to Europe.

Made in the kilns of Jingdezhen, Kraakporselein had a metallic feel. It was thin, resonant, often moulded around the rim (Valenstein 1975: 161). The type was extremely popular in Europe.

Transitional Period (1620-1644 CE)

The transitional period in the ceramic industry of China was started after the death of emperor Wan-li in 1620 CE and it continued up till the arrival of the new dynasty
fig. 2.21 Wu-ts’ai porcelain: Vase  
(source: Ashmolean Museum, University of Oxford)

fig. 2.22 Kraakporselein: Dish  
(source: British Museum, London)
Ch’ing in 1644 CE. Some export wares for Japanese markets were specifically made on order during this period.

Ko-sometsuke

This ware was made keeping in view the Japanese taste. The word *Ko-sometsuke* means old blue-and-white which were made in non-Chinese shapes and without any Chinese decoration. The *Ko-sometsuke* type were decorated with Japanese inspired designs such as scenes from poems; landscape scenes; contemporary textile patterns of geometric diapers, inset panels, etc. (Medley 1976: 237).

Shonzui or Shonsui

These wares were made at the kilns of Jingdezhen on special order of Japanese tea masters. The wares had finest quality in Japanese shapes, patterns and decorations in violet blue on white base (Valenstein 1975: 169). The *Shonzui* wares were inscribed with eight Japanese characters which read as *Gorogdaiyu Wu Shonzui tsukeru* (made by Gorodaitu Wu Shonzui) (Medley 1976: 238).

Swatow

The term *Swatow* is named after the port of Swatow or Shantou in southeastern Guangdong of Fujian province and was exported in large quantities to Europe, Southeast Asia and Near East. These are the porcelain wares with under-glaze blue and enamel decoration which characterised by sand adhering to the bottom and the flaking edges of the rim (Li 1996: 213). These were decorated in a number of ways - painted in under-glaze blue or incised under white, blue or celadon glazes (Valenstein 1975: 175-176).

**Ch’ing Period (1644-1911 CE)**

After the decline of Ming dynasty, a new dynasty of Jurchen tribe invaded China which is known as Ch’ing dynasty. The porcelains of Ch’ing period once again became popular as they adopted Chinese art and patterns in pottery making. The porcelains of earlier Chinese taste were manufactured along with the porcelains for
foreign markets during this period. Influences of western styles were greatly noticed on porcelain (Valenstein 1975: 177). The two most popular emperors of Ch’ing dynasty were Shun-chih (1644-1661 CE) and K’ang-hsi (1662-1722 CE). The period of K’ang-hsi was considered as the golden age of Ch’ing porcelain which reintroduced several varieties of porcelain.

Blue-and-white

The blue-and-white porcelain were reintroduced under the reign of K’ang-hsi. The cobalt blue of this period had a deep sapphire hue set on the white background. These porcelains had different qualities which ranges between the pieces made for imperial use and those which were specifically prepared for export purposes (Valenstein 1975: 179).

Red-and-white

Under-glaze red-and-white was introduced during the Yuan period which continued to be produced during the early Ming period. After a long gap, this variety was re-introduced in Ch’ing period. The decorations on this variety consist of Chinese dragon motifs (Valenstein 1975: 19).

Famille verte enamels

The class of ceramics to which the name famille verte is given has two parts. One consists of ordinary over-glaze decorated pieces (fig. 2.23), and the other of enamel on biscuit pieces. The distinctions between them are not always very clear. It is generally found that the enamel on biscuit type lends itself to slightly denser treatment and the use of white areas in drastically reduced. The name famille verte was coined by Jacquemart in the 19th century and has
remained convenient for the porcelain decorated in translucent enamels, among which green is dominant. The decorations are enormously varied, as are the shapes. Birds, flowers, landscape scenes with or without figures, scenes of romance, often with tall young elegant ladies, auspicious emblems, and flower baskets are a large part of the repertory (Medley 1976: 242-243).

_Famille verte_ enamels are brightly coloured and translucent and are applied fairly thickly over darker outlines and details. In addition to the various greens, the set of colours includes yellow and aubergine, a rather flat coral-toned iron-red, white (an effect achieved by allowing the pure body to show through an almost colourless enamel), and black (a composite colour consisting of mat brownish black pigment covered with green, aubergine, or clear enamel) (Valenstein 1975: 180).

![Famille verte porcelain: Vases](source: British Museum, London)
Technology and Techniques

The manufacturing of porcelain was started during the late 8th or early 9th century CE during the T'ang dynasty. It is a fine ceramic, famous for its whiteness, glaze, and hardness since the time its manufacturing began. Although it is not entirely necessary that porcelain may look completely white every time as its raw material may contain certain impurities. The clay and stone used for its manufacturing can sometimes include iron oxide that may cause a change in colour of raw porcelain to brown, grey or yellow and in later stages of post-firing it develops a greyish tint (Kerr and Wood 2004: 9).

Porcelain was a unique pottery on which the glaze becomes a part of the clay body and formed a hard surface which cannot be scratched with a knife. The other quality of porcelain is its resonance, in other words, it gave a musical note when lightly struck (Silcock 1939: 13). Porcelain is also described as a translucent pottery. The word translucent meant a glass-like shine and the translucency depends on the thickness of the core. The actual measurements of fine porcelain would be between 5 and 6 mm. for the early varieties, and 8 mm. for the finer Ch’ing porcelain of 17th-18th century CE (Lindberg 1947: 3).

Porcelain was a different variety of ceramic in comparison to earthenware and stoneware. Earthenware generally has a coarse body baked on a low temperature and stoneware are high-fired wares but baked at lesser temperature as compared to porcelain. Chinese have divided ceramics into two types, thao which means low-fired earthenware and stoneware and the tzhu which stands for high-fired stoneware and porcelain.

Term: Porcelain

The word porcelino was first used in 13th century by Marco Polo, a Venetian traveller. He used the term for describing two dissimilar commodities in different contexts while travelling in China. In the first instance, he mentioned about porcelain as white cowrie shells which were used like small currency or money for exchanging commodities in
China, India and Southeast Asia (Wright 1886: 263). The second reference of porcelain was found when Marco Polo mentioned about cups or bowls and dishes of porcelain ware manufactured in the city of Tin-gui located near the port of Zai-tun (now Quanzhou) (Wright 1886: 344-345). He mentioned porcelain as ‘bowls of the colour of azure, and very shining and beautiful beyond measure’ (Carswell 2000: 19).

The first recorded use of the term in Europe comes from the Maritime Code of Barcelona (1250 CE), where the Spanish word *porcelanas* refers to cowrie shells (*Cypraea moneta*) in a list of products imported from Alexandria (Carswell 2000: 18). In Persian and Ottoman texts, the word *faghfuri* is used for porcelain which is derived from the word *faghfur*i.e. emperor of China (Kerr and Wood 2004: 146).

There are differences between eastern and western countries regarding the accurate definition of porcelain. The debates are plenty on the essential qualities of porcelain like colour, translucency and vitrification. The arguments of the eastern countries doesn’t match with the western criteria as the manufacturing of porcelain started in Europe after 17th-18th century CE when for the first time porcelain stone mixed with kaolin was used. These ingredients were already in use as early as 9th-10th century CE for making porcelain in China. The site of Jingdezhen in south China was rich in kaolin which is used for making porcelain. The essential qualities in porcelain i.e. hardness, whiteness and translucency were found in the southern as well as northern Chinese white wares (Vainker 1991: 66). But the techniques and ingredients for manufacturing of porcelain remained a secret as the Chinese did not try to get in contact with the western countries directly (Carswell 2000: 11). The trade of other goods and porcelain passed through several merchants of different countries and origins before reaching in the western world.

The secret of porcelain manufacturing was not known in Europe until the 18th century CE. Its ingredients came to light when one day an alchemist namely Johann Friedrich Bottger accidently discovered its composition while trying to turn base metal into gold. This discovery is the prime reason behind the foundation of the porcelain industry at Meissen in Europe (Gleeson 1996; Carswell 2000: 11-12).
Raw Material

The geographical and geological differences between south and north China caused a distinction between the raw materials used for manufacturing Chinese porcelain. The geology has proved that millions of years ago, the north and south China were separate lands which collided during the Triassic period (Kerr and Wood 2004: 50). The details of the incident were described by two Chinese authors - “What we are concerned with is a series of northwards migrating blocks, moving at different rates. Their collision was often due to a quicker bloc catching up with the slower one in front of it...After the collision of north China with Siberia in the late Permian, there came the head-on collision of south China, which caused the significant mountain building of the Indosinian Orogeny in the Ladinian” (Kerr and Wood 2004: 50). The Chinese ceramics especially porcelain of south and north China have clearly showed compositional differences because of this geological distinction.

The necessary ingredients for manufacturing of porcelain are kaolin or China clay/ porcelain clay and porcelain stone which was later transformed into pai-tun-tzū (petuntse) i.e. little white bricks (fig. 2.25), often used for describing porcelain stone. The analysis of the raw materials and kiln residues have suggested that the deposits of clay and stone used for porcelain manufacturing were situated in the close proximity of the production sites itself (Kerr and Wood 2004: 40).

The inclusion of porcelain stone as one of the main ingredient together with kaolin led to the invention of porcelain in China. The deposits of China stone are abundant in south China and it was found extremely suitable for preparing porcelain. Before the accidental discovery of the composition of porcelain in the west, it was assumed that
only kaolin was used in high quantity. But the kaolin has about 40% of alumina which is difficult to vitrify if used alone and can only be fired below 1400°C (Yanyi 1987: 4). The use of pure kaolin only resulted in producing earthenware. Therefore, porcelain stone was mixed with kaolin which can be fired between 1200 to 1300°C.

According to recent studies on the raw material of porcelain, it has been found that the porcelain stone is an air-slaked granite product while porcelain clay is micaceous in nature which sometimes solely used for manufacturing of porcelain. The porcelain clay and porcelain stone were often procured from the same mine. The only difference is based on weathering. There is only a minute transition between the two as per which porcelain clay can be found on the surface of the mine but when “digging deeper, because of the decrease in the degree of weathering, the mine displays a gradual transition to porcelain stone” (Zhu and Wang 2011: 178). It was further said that “the porcelain clay should be defined as a ground-like or mud-like rock, composed by quartz and a series of minerals of sericite-hydromica, featured with high Potassium, high Silicon, poor Aluminium and low Iron” (Zhu and Wang 2011: 178). Therefore, porcelain clay itself is the product of porcelain stone. It shows that the kaolin or porcelain clay is not different clay but is actually a product of porcelain stone. The further studies though on this aspect are still going on.

It is believed that in some mines of south China, the porcelain clays formed from porcelain stone were already found in refined form which was termed as kaolin originated from the word gaoling means ‘high ridge’ (fig. 2.26).

The early southern porcelain had mixture of quartz and mica. As per a study of the raw material used in the five dynasties white wares at Jingdezhen, it was found that only the porcelain stone is used and kaolin is not added. The rock used was naturally having a mixture of quartz, mica and primary clays. The analysis suggested that the contents of natural clay in the
porcelain were about 10-20\% and rest of the contents were weathered porcelain stone (Wood 2007: 48). Similar studies on raw material were also done in provinces of Zhejiang and Dehua where no addition of kaolin was noticed (Yanyi 1987: 8). It was during the Yuan period, when the kaolin was added with porcelain stone for manufacturing of porcelain which has been proved by a study done by Zhou Ren et al. in 1958. According to this analysis (Table 1), the porcelains produced at Jingdezhen were constituted of three minerals - quartz, kaolinite and mica (Yanyi 1987: 8). The *Mingsha* kaolin obtained from Fuliangdong xiang, located about 45 km from Jingdezhen was typically used in porcelain. The kaolin namely, *Xingzi* and *Linchuan* were also similar in composition as *Mingsha* kaolin.

<table>
<thead>
<tr>
<th>Types of kaolin</th>
<th>SiO₂</th>
<th>Al₂O₃</th>
<th>CaO</th>
<th>MgO</th>
<th>K₂O</th>
<th>Na₂O</th>
<th>Fe₂O₃</th>
<th>TiO₂</th>
<th>MnO</th>
<th>IL*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mingsha</td>
<td>49.65</td>
<td>33.82</td>
<td>0.33</td>
<td>0.23</td>
<td>2.70</td>
<td>1.03</td>
<td>1.13</td>
<td>0.05</td>
<td>0.33</td>
<td>10.84</td>
<td>100.11</td>
</tr>
<tr>
<td>Xingzi</td>
<td>51.89</td>
<td>31.70</td>
<td>0.91</td>
<td>2.05</td>
<td>1.54</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>11.01</td>
<td>99.97</td>
</tr>
<tr>
<td>Linchuan</td>
<td>46.57</td>
<td>36.29</td>
<td>1.03</td>
<td>0.27</td>
<td>1.57</td>
<td>0.17</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14.64</td>
<td>100.54</td>
</tr>
<tr>
<td>Mingsha (refined clay)</td>
<td>47.69</td>
<td>36.01</td>
<td>0.40</td>
<td>2.5</td>
<td>2.51</td>
<td>0.95</td>
<td>0.99</td>
<td>0.04</td>
<td>0.14</td>
<td>11.12</td>
<td>100.10</td>
</tr>
</tbody>
</table>

*Ignition Loss (source: Yanyi 1987: 8)*

The porcelain stone contains quartz in large quantity as a result it was easily transformed into porcelain even if used alone. The lightly weathered porcelain stone generally contains feldspar but the severely weathered porcelain stone contains large quantities of quartz and mica. Further, prolong weathering of porcelain stones may convert it into the minerals of kaolin. Therefore, severely weathered porcelain stone was generally used for making the porcelain and the one which is less weathered was used in the glaze (Yanyi 1987: 4).

The deposits of porcelain stone were noticed in the provinces of Zhejiang, Jiangxi, Fujian, Jiangsu and southern Anhui. Except Zhejiang, rest of the provinces had porcelain stone having high quartz content. The porcelain stone of Zhejiang had high iron content which were difficult to wash out and sometimes washing led to opposite effect which increased the iron (Yanyi 1987: 5).

The opinion regarding the contents of porcelain differs among ceramic specialists but
it is somewhat essential that the porcelain should have two main ingredients kaolin and porcelain stone in appropriate proportion. These should be combined together and baked above 1280°C that is necessary for gaining the vitrification, glassification and hardness of the clay body (Valenstein 1975: 57).

Preparation of Clay

The two main ingredients required in the preparation of porcelain clay are porcelain stone and porcelain clay or kaolin. These were combined together to prepare a refined clayey mixture suitable for making porcelain wares.

Chinese Porcelain Stone

The Chinese stone is the main ingredient of porcelain. This stone is hard and has a slightly greenish tint in its raw form. To gain plasticity, it was necessary for the Chinese potters to prepare it by the process of weathering and crumbling. Most of the ancient Chinese sites like Jingdezhen and Dehua preferred traditional techniques for refining porcelain stone. The steps for the refining of porcelain stone are noticed by Rose Kerr and Nigel Wood (2004: 226) at Jingdezhen which is described below in brief -

The huge porcelain stones were procured from the mines and broken into small pieces using the hammers. The pieces of stones were dry crushed using the large water-powered trip hammers (fig. 2.27-2.28) Sometimes animal-drawn hammers were also used for crushing the stones. The powdered form of stones was casted into water tanks and stirred thoroughly using the wooden paddles. The clay was kept until it becomes fine forming a scum on the surface. It was again skimmed and putted in another tank. This procedure was repeated a number of times after which the clayey material is left for evaporation. The prepared white clay was then taken out to thicken up and kept for some time on a base of newly fired bricks. When the clay changes into stiff mud, the same is moulded into standard brick sizes and sometimes even stamped with the name of the quarry as noticed at Jingdezhen and Dehua. These prepared white bricks are known as petuntse.
fig. 2.27 Use of water-powered trip hammer
(source: http://www.thewanlishipwreck.com/TangYing.html)

fig. 2.28 Jingdezhen, China: Remains of water-powered trip hammer
(source: Oriental Ceramic Society, Hong Kong)
There are two important Chinese literary accounts, *Chingsi Sheng Ta Chih* of 1567 CE (*Chingsi Sheng Ta Chih*, chapter 7, pp. 5b-6a as referred by Rose Kerr and Nigel Wood), and *Ching-te-chen Thao Lu* written in 1815 century CE (*Ching-te-chen Thao Lu*, chapter 4, pp. 2a-b as referred by Rose Kerr and Nigel Wood), both have mentioned the procedure for preparation of raw materials for manufacturing of porcelain.

The first account mentioned about the inclusion of “official clay” with porcelain stone obtained from kaolin/ *gaoling* for manufacturing fine wares (Kerr and Wood 2004: 226). The second account specified that the clay used for ceramics was prepared from locally collected rocks which had markings like deerhorn plant in black colour (fig. 2.29) (Kerr and Wood 2004: 228). The text also mentioned mines from where porcelain stone was obtained including the site of kaolin. So, these literary records confirms the use of both kaolin and porcelain stone at Jingdezhen for making porcelain obtained from a mine namely *gaoling*.

**Porcelain Clay/ Kaolin**

The kaolinised porcelain stones were used for porcelain manufacturing as early as 10th century CE. The use of clayey form of kaolin as separate ingredient intermixed with porcelain stone was occasionally used prior to 13th century CE. Kaolin as a separate ingredient in the clay form was used at Jingdezhen during the Yuan period (Kerr and Wood 2004: 229).

In this period, the special clays were used for manufacturing imperial ceramics. This special clay was called as *yu-thu* (imperial clay) which was obtained secretly and its use was prohibited for the private manufactories. The *yu-thu*, mentioned by a Chinese
official, Khung Chhi in 1363 CE was a powdered clay coming from Jao-chou (Chih Cheng Chih Chi, ch. 2: 41; ch. 4: 35 as referred by Rose Kerr and Nigel Wood). He further mentions about the imperial porcelain dishes, “Present wares are not fine enough... when I was at home cousin Shen Tzu-Chheng returned from Yu-kan prefecture [in Chiangsi] with two meat dishes, said to have been made 30 years ago in the imperial clay kiln” (Kerr and Wood 2004: 235-236). Here, Khung Chhi is mentioning the period of about 1322 CE in which imperial clays were used in the palaces for making porcelain. The clay used was probably obtained from the mines at Matshang. Mention of the Matshang mines for procuring imperial clay or official clay was also noticed in Ming period’s text, Chiangsi Sheng Ta Chih (16th century CE). This text mentions, “Pottery clay for official wares (kuan-thu) comes from Ma-tshang mountain in Hsin-cheng-tu…… the clay has blue-black seams (carbonaceous material) and spots like grains of sugar (quartz), as translucent as white jade and with golden spots like stars (mica)” (Chiangsi Sheng Ta Chih, chapter 7: 4a-b as referred by Rose Kerr and Nigel Wood).

A number of archaeological investigations were done in the region of Hsin-cheng-tu located near Gaoling (about 55 km northeast of Jingdezhen) where piles of ancient leftover clays have been noticed. The study of these clay samples have showed that it was obtained from the mines of Matshang which is similar to kaolin. A contemporary Jingdezhen scholar, Liu Hsin-Yuan confirms that Matshang was a prime source of porcelain clay right from the Song period to the reign of Wan-li of Ming dynasty (Kerr and Wood 2004: 236). During the Wan-li reign itself in about 1583 CE, the deposits of porcelain clay exhausted at Matshang, as a result, mines at gaoling became prime source for obtaining porcelain clay (Kerr and Wood 2004: 236).

But the point arises that why kaolin in clay form needed by the Chinese potters especially at Jingdezhen when the earlier porcelains were made without mixing it. On this Guo Yanyi (1987: 8) has mentioned that, “the addition of kaolin increased the range of firing temperatures for porcelain, reduced the ratio of deformed pieces, and increased the strength and quality of the body and glaze of the wares”. Commenting on Yanyi’s remarks, Kerr and Wood explained that the additions of kaolin in porcelain
specially in later Jingdezhen wares produced smooth (lower quartz) and tough bodies (with higher mullitise) (Kerr and Wood 2004: 238).

Methods of Porcelain Making

The procedure for making of porcelain bowl, dishes, etc. is similar as any other pottery making technique. It is the clay of porcelain which makes the drastic difference and develops a distinct white porcelain body. Other than this, decorating white body with exuberant designs using different colour pigments, glazing and firing are also significant.

Threading on Wheel

The first step for pottery making is throwing clay on wheel. The porcelain was made in the similar way as other potteries were prepared. The potter throws a ball or lump of prepared plastic clay in the centre of the wheel. Water is applied immediately and the clay is pressed firmly to make a well in the centre (fig. 2.30). The firm pressure is again applied so that the wall of the pottery may become thin and take the desired shape. For thinning the wall and giving a proper volume, potter firmly presses the wall of the pottery using one hand inside and the other outside. The rim is accordingly compressed and shaped. The water is constantly used on the clay so that the pot may not collapse.

Afterwards, the prepared pot is firmly cut-off using a string or wire. In East Asia and sometimes in China also, a different method is used for removing the pot from wheel. The method is described by Rose Kerr and Nigel Wood (2004: 67) - “A dusted circle is made on the wheel-head by sprinkling sand or ash, within a temporary bamboo ring. The ball of clay is then dropped on to this dust, overlapping it slightly so the clay is
attached only at its outer edge. When the vessel is finished it is released from the wheel-head by a slight undercut of the clay at its foot. This allows to be easily lifted off”.

Turning

An important step in pottery making is turning which is also used for manufacturing of porcelain wares. It is a process in which a leather-hard pot is firmly held in one hand and then the excess clay may be removed using an edged tool. It is generally done to finish the foot-rings, lids and covers of the pottery. The Chinese potters usually applied this process for making an accurate profile of the entire porcelain piece. Porcelains made in southern China were turned after nearly dry stage. The curved blades of iron (fig. 2.31-2.32) were used on the inner side of the pot; toothed blades were preferred for initial turning and cutting; and plain-bladed tools for final finish (Kerr and Wood 2004: 73).

Moulding

Moulding is another significant step in porcelain making especially in China. The technology of making pottery using moulds developed during the Shang period. After that moulding became another procedure for making ceramics in China other than the wheel-turning method. Moulds were often used for giving a precise shape to a wheel-turned pottery. It was done to obtain the similar shape and size of ceramics especially bowls.
Different sizes of moulds were used for shaping the Chinese ceramics. Sometimes the clay was directly pressed into open moulds and after drying it automatically comes out of the moulds. The moulded sections were often joined together in leather-hard condition to form closed vessels. Even sometimes the two moulds were used in which the clay is placed. This technique was extremely useful for making the rim portions of the bowls, dishes and jars. The moulds were often had elaborately carved designs which were used on ceramics.

Painting and Decoration

Before application of glaze on white porcelain body, the designs using different colour pigments and sometimes using techniques like carving, incising and mouldings were made. Different colour pigments were used for obtaining good results. The copper is used for red colour, cobalt for blue, etc.

Cobalt Pigment - Cobalt ore was used for obtaining the blue colour on porcelain. This ore is rich in iron oxide and sometimes may also contain arsenic, nickel and copper. It was believed that cobalt-rich rocks were imported from Persia to Jingdezhen after 14th century CE. The studies on this aspect are still going on as China already had local cobalt-rich rocks which they used for decorating porcelain.

The analysis of cobalt blue pigments under the glaze are little difficult as the glaze applied on the decoration also contains some similar constituents as the pigment. But back in 1950, a study on cobalt pigment found in the blue-and-white porcelain wares of Jingdezhen was done at Oxford University which shows the pigment ratio of cobalt to iron and cobalt to manganese. The results as shown in Table 2 (on page 127) brought out that the iron-cobalt mixture was used as colouring pigment during the Yuan period which changed to manganese-cobalt pigment during the early Ming period (15th century CE).
The re-examination of the results was done by Nigel Wood and some shortcomings were found. He mentioned that cobalt-rich rocks generally contain nickel and copper which were not analysed in this study. Another point was that this pigment contains some amount of silica and alumina which can affect the colour of cobalt and turn it in red-blue because of the formation of cobalt-silicates (Wood 2007: 64).

As the 15th century passed, the manganese-cobalt ores which were local to China were more preferred instead of the exported ones. But during the Jijiang period (1522-1566 CE), the iron-cobalt ores once again came into use (Wood 2007: 64).

Copper Pigment - The copper was used primarily for obtaining the designs painted in red colour on porcelain. Firing of copper is not as easy as compared to cobalt. It tends to stain and sometimes it looks hazy as copper spreads easily in the surrounding areas of glaze. It was often used together with cobalt blue decorations under the glaze.

To know the constituents of copper pigments on post-Yuan porcelain, an analysis on 14th century under-glaze red porcelain was done in 1985 by Robert Tichane in New York. He used the destructive X-ray analysis and found rich copper and sulphur along with traces of arsenic. While examining in the middle of glaze thickness, Tichane noticed a hazy red cloud presumably colloidal copper metal which caused the red colour. His final results mentioned that “the Chinese, rather than using copper oxide or
copper metal, were using copper sulphide as a colourant in this 14th century specimen” (Tichane as quoted by Nigel Wood). Therefore, for obtaining red colour, the Chinese potters were using copper-arsenic sulphides and may be also hydrated copper-arsenic minerals which could be olivenite or oxidised arsenical-copper metals (Wood 2007: 175).

Another study was done in 1992 at the Victoria and Albert Museum, London on a Yuan period under-glaze red porcelain potsherd. It was found that copper was used together with substantial amount of iron. The presence of iron increased the fusibility which results a spread of red colour within the glaze (Wood 2007: 175).

Therefore, it shows that during the Yuan period, the copper mixed with iron was used as a red colour pigment but in the post-Yuan period, copper-sulphur-arsenic ore was used.

Glazing

The technique of glazing on Chinese ceramics was first discovered during the Shang period. The glaze was applied both on the earthenware and stoneware. It is believed that the discovery of glaze in China was accidental due to fall of ash (containing minerals and silica components) on pot during the process of firing in the kiln. This accidental glazing produced gloss and changed the outer layer of pottery into colours like greenish-yellow or brown and even sometimes the heavy ash fall produced bluish-grey glaze (Medley 1976: 41). It all depends on the temperature of kiln and atmosphere inside. Analysis indicates that most of the Shang period glazes were of high-fired leadless variety fusing at temperatures between 1100-1200°C (Medley 1976: 41). Thereafter, glazing became an integral part of pottery making and it is applied till date in China.

The Chinese glazes are usually of two types, ones which mature at low temperature and the other which matures at high temperature. It has been generally found that the low-fired glazes are fluxed with lead but some are leadless and of alkaline types as well while the high-fired glazes are alkaline in nature (Medley 1976: 14). On
porcelains generally high-fired glazes were used. The glaze was either applied by
dipping the bowl or dish in the container filled with liquid glaze or by brush.

Glazing of porcelain was done for two reasons, first was for beautifying and second for
making it non-porous by sealing its body. There is another advantage of glazing which
can increase the strength of a ceramic after firing. The coating of glaze on most of the
clay surface of porcelains is found to be as thin as one millimetre. The ceramic glazes
may look translucent which is actually an effect caused by scattering of light within the
glaze's thickness. The glazes have properties like raised viscosities which prevent it
from running down at high temperatures. The other quality of reduced expansivities
helps in expanding and contracting of glazes with the clayey body.

For understanding the composition of glaze and properties, it can be divided into
northern and southern glazes.

Northern Glazes - In north China, the lime glazes were applied on porcelain body. This
glaze was somewhat same as the glaze used on greenwares. The early Hsing or Xing
white ware had lime based glazes which included low titania secondary kaolin but
refined kaolin was also used. The pure or refined kaolin clay in glaze was used to get
whiter surface as the titania based clay used in glaze gives yellowish tint on the
surface.

The lime-alkali type glaze was used in the Gonxian kiln sites located in Henan
province. The contents of this glaze were calcia and potassium + soda in the ratio of
2:1 (Wood 2007: 96). An Analysis of this glaze type was done on the ceramics of Sui
to T'ang periods is given in table 3 -

| Table 3: Contents of Glazes in the Wares of Sui to T’ang Periods |
|-----------------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                       | In percentage   |                |                |                |                |                |                |
| Gongxian (lower alkali)| SiO₂  | Al₂O₃ | TiO₂ | Fe₂O₃ | CaO | MgO | K₂O | Na₂O |
| Gongxian 1 glaze      | 64.6 | 13.9  | 0.2  | 0.8   | 12.3| 1.9 | 3.0 | 2.2  |
| Gongxian 2 glaze      | 67.7 | 15.9  | 0.4  | 0.9   | 10.8| 1.5 | 2.4 | 0.8  |
| Gongxian (higher alkali)|   |       |      |       |      |      |      |      |
| Gongxian 1 glaze      | 62.5 | 17.0  | --   | 0.7   | 10.4| 1.1 | 4.1 | 2.1  |
| Gongxian 2 glaze      | 66.8 | 14.5  | --   | 0.9   | 9.3 | 1.1 | 4.3 | 1.75 |

(source: Wood 2007: 97)
The production of Ding wares was first started at the site of Lingchen in Hebei province during the T’ang period but it became famous during the Song period. The analysis have suggested that Ding glazes are rich in the low-contracting oxides of silica, aluminium and magnesium which means the final contraction of glaze was less than the clayey bodies as mentioned below in the table 4. The presence of high quantity of magnesia in Ding glazes made it craze-resistant (Wood 2007: 103).

<table>
<thead>
<tr>
<th>Period</th>
<th>SiO₂</th>
<th>Al₂O₃</th>
<th>TiO₂</th>
<th>Fe₂O₃</th>
<th>CaO</th>
<th>MgO</th>
<th>K₂O</th>
<th>Na₂O</th>
<th>MnO</th>
<th>P₂O₅</th>
</tr>
</thead>
<tbody>
<tr>
<td>T’ang</td>
<td>73.8</td>
<td>17.3</td>
<td>0.1</td>
<td>0.5</td>
<td>2.9</td>
<td>2.15</td>
<td>1.56</td>
<td>1.3</td>
<td>0.04</td>
<td>--</td>
</tr>
<tr>
<td>Five Dynasties</td>
<td>74.6</td>
<td>17.5</td>
<td>0.2</td>
<td>0.5</td>
<td>2.7</td>
<td>2.3</td>
<td>2.0</td>
<td>0.6</td>
<td>0.02</td>
<td>0.2</td>
</tr>
<tr>
<td>Northern Song</td>
<td>72.1</td>
<td>17.5</td>
<td>0.2</td>
<td>0.75</td>
<td>3.9</td>
<td>2.3</td>
<td>2.0</td>
<td>0.5</td>
<td>0.03</td>
<td>0.3</td>
</tr>
<tr>
<td>Jin</td>
<td>71.2</td>
<td>19.7</td>
<td>0.45</td>
<td>0.6</td>
<td>4.45</td>
<td>1.6</td>
<td>1.6</td>
<td>0.3</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

(Source: Wood 2007: 103)

As Hsing ware glazes, the Ding glazes also had lower titania, which suggests either the use of pure clays in the glaze or the use of lime-rich, high-alumina mineral, such as lime feldspar.

Southern Glazes - The production of porcelain in the south China progressed late in 10th century CE as compared to the north China porcelains. The south China had several kiln sites but the most popular kilns were at Jingdezhen and Dehua. The study of the porcelain suggests that the lime-alkali types of glazes were used in south China. The glaze itself might have produced by adding porcelain body material along with limestone which included contents like calcium oxide (10.9%), alkali content (3%) and high Silica level (Wood 2007: 50).

The use of lime-alkali glaze became less at Jingdezhen by the end of 10th century CE and a new type of watery-blue lime or yingqing/ qinghai glaze were used. This yingqing ware was continued to produced from Song to Yuan period. The analysis have confirmed that these blue glazes were also composed of Calcium carbonate mixed with porcelain body material but the quantities of Calcium carbonate were higher as compared with earlier glazes during five dynasties (Wood 2007: 51). The Calcium carbonate was obtained from the cheap and easily available material like...
wood ash, chalk, limestone, marble and mollusc shells of both marine and fresh water (Cardew 1969: 51-53). But soon the pure limestone was preferred instead of wood ash in the glazes in southern China.

At Jingdezhen, limestone was prepared after burning with wood and after which washing was done to remove the traces of ash (Kerr and Wood 2004: 554). This limestone after burning is known as glaze-ash. Most of the *yingqing* glazes are pure examples of lime-glaze types. The use of lime-alkali glazes at the Jingdezhen was found on a few porcelain pieces prior to 14th century CE. Later, the lime-alkali glazes were treated perfect for covering blue painted motifs and designs on white porcelain base. This glaze type is still being used at the Jingdezhen for blue-and-white porcelain variety. The basic difference between the glaze having high limestone and low limestone can be judged by its appearance. The glaze with high limestone will be watery and transparent while the low limestone would be white and semi-opaque. By the 15th century CE, the use of refined, smooth white glazes with low-lime content became less on plain white wares but it was preferred for over-glaze enamels (Kerr and Wood 2004: 560).

In early 14th century CE, a new type of glaze appeared which is known as shu-fu. It was opaque and sugary white in appearance. It was an official ware of Yuan dynasty as it bears the moulded words *shu fu* i.e. privy council. The glaze on this ware contains very little quantity of glaze-ash i.e. only 10% which means that some Silica particles in the glaze stone remained un-dissolved and gives an effect of white matted with un-melted quartz contents (Wood 2007: 59). This is one reason that shu-fu glazes were applied on thick porcelains with blunt rims which were decorated with moulded designs.

Another popular variety produced at Jingdezhen was under-glaze blue-and-white porcelain. The glaze used on it was lime-alkali based which is less fluid and does not spread in firing (Wood 2007: 61). The glaze-ash used in this type is 15% which is mixed with the porcelain stone. The glaze finally appears translucent and smooth on this variety of porcelain.
A variety of wares were produced at Jingdezhen from 10th to 15th century CE having different glaze contents is shown in table 5.

Table 5: Glaze Contents in Porcelain Wares of Jingdezhen

<table>
<thead>
<tr>
<th>Date</th>
<th>Ware type</th>
<th>Glaze type</th>
<th>Glaze-ash (in %)</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early 10th cent.</td>
<td>White</td>
<td>Lime-alkali</td>
<td>20</td>
<td>Smooth, translucent, white</td>
</tr>
<tr>
<td>Late 10th-14th cent.</td>
<td>Qingbai</td>
<td>Lime-alkali</td>
<td>30</td>
<td>Icy-blue, transparent</td>
</tr>
<tr>
<td>14th cent.</td>
<td>Shu-fu</td>
<td>Alkali-lime</td>
<td>10</td>
<td>White, opaque, slightly matt</td>
</tr>
<tr>
<td>Mid to late 14th cent.</td>
<td>Under-glaze blue</td>
<td>Lime-alkali</td>
<td>15</td>
<td>Smooth and translucent</td>
</tr>
<tr>
<td>Early 15th cent.</td>
<td>Thien-pai ware</td>
<td>Alkali-lime</td>
<td>0 to 5</td>
<td>Very white, slightly translucent</td>
</tr>
</tbody>
</table>

(source: Kerr and Wood 2004: 560)

Another significant porcelain site in south China is at Dehua in Fujian province. The kilns began during the Song period and continued till Ming period. In a similar tradition as Jingdezhen, at Dehua also, the potters use glaze ash or Calcium carbonate as main glaze flux. The high content of alkali in Dehua porcelain stone made extremely refined transparent glazes in which only small quantity of glaze-ash was added (Wood 2007: 71).

The Longquan celadon is a significant ware of south China. It has high-alkali and high-silica material similar to white porcelain of Jingdezhen. There is a minor difference though as Longquan celadon has slightly higher iron and titanium oxide contents and the thick glaze on this celadon ware has high iron-oxide content (Wood 2007: 75). Its glaze is thick and lime-alkali based. In appearance it has blue-green or sea-green or olive-green colour which depends on the quantity and ratio of titania and iron oxides (Wood 2007: 77).

The firing temperature of different porcelain varieties largely depend on the quantity of contents in the glaze. For instance, shu-fu glazed porcelains are marginally under fired while the thien-pai or sweet white glazed porcelains were completely fired, even
sometimes over-fired. On the basis of certain analysis, temperatures of firing some of the wares are mentioned by Rose Kerr and Nigel Wood in table 6.

Table 6: Temperature of Firing for Different Porcelain Wares

<table>
<thead>
<tr>
<th>Dynasty</th>
<th>Type of Wares</th>
<th>Firing Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five dynasties</td>
<td>white</td>
<td>1230-1250°C</td>
</tr>
<tr>
<td>Song</td>
<td>qingbai</td>
<td>1220-1250°C</td>
</tr>
<tr>
<td>Yuan</td>
<td>shu-fu</td>
<td>1250-1280°C</td>
</tr>
<tr>
<td>Yuan</td>
<td>blue-and-white</td>
<td>1250-1280°C</td>
</tr>
<tr>
<td>Ming</td>
<td>Yung-lo thien-pai</td>
<td>1290-1310°C</td>
</tr>
</tbody>
</table>

(Source: Kerr and Wood 2004: 561)

Other High-Fired Coloured Glazes

In about 14th-15th century CE, a number of coloured glazes developed specifically at Jingdezhen. The popular glazes were copper-red, cobalt-blue and iron-yellow amongst which in the first two colouring oxides were added in little quantity. The third one develops a warm and transparent yellow glaze which is often applied on porcelain before firing and sometime after firing.

Copper-red - The invention of this glaze type was already done in the T'ang period but it achieved finesse during the mid 15th century CE. The copper-red was already in use as a painting pigment on porcelain during the Yuan period but it appeared in glaze only during the late Yuan or early Ming periods. Copper and its oxide produced colours in varying shades which can turn into black, green-turquoise, brick-red, cherry-red, pinkish-red and then to purple. Different forms of copper and copper oxides gave distinct results.

The black colour appears when the glaze containing overloaded cupric oxide content (4% or more) remain un-dissolved or in crystalline state on cooling. It happens in oxidised condition.

The turquoise-blue and emerald-green develops when a typical cupric oxide concentration in a transparent glaze would be 2-3% CuO. “Technically, copper in this state is known as Cu^{2+} ions, as the copper and oxygen atoms in CuO separate when in
glass-solution while still being electrostatically bonded. In transparent lead glazes, in lime glazes, and in lime-alkali glazes, Cu²⁺ ions give transparent green colours. When the main glaze fluxes are potassium and/or sodium oxides the solution colour provided by Cu²⁺ ions is a fine turquoise-blue” (Wood 2007: 168). This process also takes place during the oxidised conditions.

The bright brick-red colour will appear when unstable red brown minerals in air slowly changes to CuO. Being in reduced state, the crystalline minerals trapped in glaze will not re-oxidize and produce brick-red colour but only if the cuprite crystals are big enough otherwise yellow colour would appear (Wood 2007: 168).

The copper metal (Cu), an reduced form of copper is a main source in copper-red glazes. The copper cannot remain in solid forms in the glazes during high-firing (as its melting point is 1083°C) but it solidifies below its melting point after cooling of the glaze (Wood 2007: 68). The red colour will appear if the cooling process will not be too slow.

Cobalt-blue - In a similar manner as copper-red, the blue was used first as pigment for painting on white porcelain surface. Different types of blue glazes developed which includes the thick blue glaze, thin and washed-out, etc.

In the reign of Hung-Wu of Ming period, the washed-out blue glazes were found on porcelains which were used with high-temperature iron-brown or copper-red glazes (Kerr and Wood 2004: 571). This combination gave a dual effect of colours. In order to obtain navy-blue colour, it is said that during the Hsuan-Te period, four to five layers of cobalt-blue glaze were applied (Kerr and Wood 2004: 571). The cobalt-blue glaze is generally a mixture of glaze ash, cobalt and porcelain stone.
Firing

All the clays cannot survive in high-firing as stone ware and porcelain can. The common clay used for making earthenware may turn into black glass if baked at high temperatures. There are specific temperatures for firing different potteries. The colour of fire itself shows different modules of temperatures inside a kiln (fig. 2.33). For example, red coloured heat is essential for firing a simple pot. Likewise, orange-white heat is necessary for firing of stoneware of south China and finest northern porcelain wares like Hsing or Xing (Yanyi 1987: 3-19).

The Chinese porcelain is fired between 1250-1400°C which means very high temperature. It took a few days to bake such high-fired wares. The process of firing which happens inside the kiln in itself creates dramatic effects at different stages. This event of firing porcelain in a kiln has been interestingly described by Rose Kerr and Nigel Wood. They narrates, “...firing tends to be a spectacular event, and the interior of a large stoneware or porcelain kiln at the height of a firing can be an awesome sight. A few inches of brickwork separate the viewer from the torrent of flame and the incandescent wares within. The ground the viewer stands on is hot, and resonating with the pulse of the fire, and the eyes have to be shielded from the intense glare as the ceramics or saggars shimmer in the whiteness. The firing of porcelain is a dramatic event, but the feeling that weeks or months of effort have been committed to an extreme and difficult finishing process is not restricted to porcelain” (Kerr and Wood 2004: 52).

The firing of potteries in a kiln can never entirely be successful and similarly it can neither be entirely lost. There could be unpredicted results as sometimes after
opening the kiln door, one can see that porcelain and saggars have become a hard mass of rock. It may have happened because of extremely fierce fire, bad saggars, nature of weather, quality of fuel, etc.

Firing of a pottery passes through a number of stages which can be divided on the basis of changes in temperature inside a kiln. In simple terms firing of pottery is removal of water from the clay which happens by the way of gradual evaporation.

In the first stage of firing, sun dried pots are kept in the kiln. The pots are dry to touch but they contain some amount of water inside the pores. At this point, if the temperature is raised high initially, a pot containing some pore water can steam too fast and finally explode. Therefore, the first 200°C are crucial for firing potteries. The firing rate should be slowly increased i.e. 30°C per hour for tiny and thin objects and 10°C per hour for heavy and thick ceramics (Kerr and Wood 2004: 56). When the firing temperature reaches at 150°C, the mechanically added water in the clay driven away but the absorbed water remains inside till the kiln temperature reaches at 200°C. At this time, the rate of rise in temperature can be increased to 100 to 150°C per hour. This stage of firing is known as ‘water smoking’ as the absorbed water generates steam which sometimes also released from the kiln’s structure (Kerr and Wood 2004: 57).

The second stage of firing involves changes which took place in the kiln between the temperature ranges of 200-350°C and then further at about 500-800°C. At this stage, initially the organic material present in the clay charred up which is found in high quantity especially in northern stonewares and porcelains of China than the southern wares. When the temperature reaches at 573°C, the quartz present in the clay undergoes a 2% volumetric expansion as the atomic bonds within SiO₂ molecule straighten which is known as the alpha-beta quartz inversion and it reverses back on cooling (Kerr and Wood 2004: 57). This is the central process of firing which converts clay into ceramic.

The clay and mica minerals consist water because of chemical weathering which is bonded within their molecular structures. Higher energy is required to evaporate this water. This is done when the process of dehydroxylisation began at 350°C and
completes at 650°C. The process is clarified by Rose Kerr and Nigel Wood (2004: 57). With a pure kaolin material this ‘water of crystalisation’ can amount to as much as 14% by weight of the dry clay, but most clays tend to be lower in true clay substance, so lose some 3-10% weight on firing. Once dehydroxilation has occurred an entirely new mineral i.e. metakaolin has formed, and the clay has converted irreversibly to pottery, through the following reaction -

\[
\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O} (\text{kaolinite}) + \text{heat} \rightarrow \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 (\text{metakaolin}) + 2\text{H}_2\text{O} (\text{water})
\]

The reaction thus shows that pottery can be created at 650°C but the firing of kiln continues at this stage. In the next stage, the carbonaceous material started burning as the temperature reaches 800°C and above. Under this case if the kiln is properly oxidised, sometimes sulphur dioxide, chlorine and fluorine also start releasing from the clay. The small amount of glass from the fine silica particle present in the clay also begins to form on the ceramics at this stage. At reaching the temperatures between 890-1100°C, the fine secondary silica particles releases and the metakaolin crystals reform after a break down (Kerr and Wood 2004: 58). The following reaction will clarify it -

\[
2(\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2) (\text{metakaolin}) + \text{heat} \rightarrow 2\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2 (\text{spinel}) + \text{SiO}_2 (\text{silica})
\]

This bond of mineral particles improves the strength of ceramics. At about 1000°C, the biscuit firing is done in China which gave strength to ceramics while cooling off.

In the next stage of firing, the changes in clay material happen at 1100°C and above as the spinel in the clay converts to mullite and more secondary silica are freed. Its reaction is as under -

\[
3(2\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2) (\text{spinel}) + \text{heat} \rightarrow 2(3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2) (\text{mullite}) + 5\text{SiO}_2 (\text{silica})
\]

This is the final stage in thermal background of kaolinite crystal where mullite was created. The mullite crystals grow larger as the firing continues to be done above 1100°C. The presence of mullites would clearly differentiate the high-fired wares such as porcelain and stoneware with earthenware (Kerr and Wood 2004: 59).
The fuels used for firing the kilns were generally coal and wood. Another fuel used for firing the kiln is dung which was easily available. Till date no evidence could be traced suggesting use of other fuels in ancient Chinese kilns.

**Shape and Size**

Ceramics in China invented during the Neolithic period in the north China. The earliest potteries of light brown colour were made for utilitarian purposes i.e. cooking, serving and storage. In the late Neolithic culture different varieties of potteries developed some of which were of black, white, red or buff colours, etc. The late Neolithic potteries were either in the shapes of jars with two small handles or in the form of jar with three legs or tripods, pedestaled wares and high-stemmed cup.

During the Shang period (2000 BCE), ceramic technology developed and glazed stoneware originated. They had somewhat similar shapes and sizes as in earlier periods but some new moulded forms were also developed. The invention of bronze utensils with moulded designs also took place in the Shang period. The bronze utensils influenced the style of ceramics also as both had somewhat same shapes, sizes and designs. The common shapes of *li*, *xian* (cook wares), *zhi* (storage jars) and *jue* (wine vessels) developed and changed with time (Li 1996: 30). In the late Shang period, the shapes like jars and step-cups became common as reported from the sites of Henan and Shandong (Li 1996: 32).

After Shang, a new culture namely Zhou (1100-220 BCE) developed. During this period the tradition of funerary wares progressed though they were produced in less refined quality. These wares were made using moulds in the shapes of bronzes. The production of glazed stoneware continued during this period but the white earthenware of Shang period was abandoned. The popular shape produced during this period was *li* (cookware) in the shape of a tripod. The other common shapes like stem-cups, jars, bowls and pots in glazed ware became famous in the Western Zhou period. Besides the pottery, the Zhou period also became famous for producing architectural pieces in ceramics for example tiles, tubes, rectangular bricks, etc. (Li 1996: 34).

During the Han period (202 BCE-220 CE), the tradition of moulded ceramics continued. High-fired glazed earthenware became popular during this period. These earthenware
are found in three distinctive shapes, jar with flaring neck and oblate body i.e. in the shape of flattened sphere, jar with dish shaped mouth, and jar with flaring mouth. The new forms were copied from the bronze utensils during this period. Some significant shapes were incense burners using the cutting and incised techniques; models of floor-mills; hollow bricks, horse models; human figurines, etc. (Li 1996: 41-42).

During the Sui period (581-618 CE), moulded shapes and designs like dragon shaped handles of jars, ewers, pilgrim flasks, etc. became quite common. The common domestic shapes produced during this period were bowls and dishes. As Buddhism progressed in China, it influenced the pottery shapes also. The ceramics like censers and water sprinklers used during the Buddhist rituals were produced in large numbers (Vainker 1991: 67). The Persian influence was also seen on the Sui pottery in the form of pilgrim bottles and rhyton decorated with beaded borders and roundel motifs (Vainker 1991: 64).

During the late T’ang period (8th-9th century CE) a new variety of Chinese pottery originated i.e. white porcelain which was an extremely refined high-fired ware. The early white porcelains had entirely different shapes and sizes. They were made in the shapes globular jars with incised designs, small bowls, dishes with carved, incised and mould impressed designs, etc. The period also witnessed influence of Persian silver and gold wares as their shapes were imitated in porcelain especially in Yueh celadon ware (fig. 2.34) and white ware (Gray 1963: 15). The white stoneware in the form of jars, long-necked vases, amphora, etc. also developed during this period.

During the Song period (960-1279 CE), new varieties of porcelain with celadon glaze as well as bluish-white glaze developed which were made in the shapes of ewers (fig. 2.35 on page 140), dishes, moulded pillows, jars with covers, etc. Similar as
T’ang period, the porcelain of Song period was also influenced by the bronzes. The double gourd flasks (fig. 2.36) first appeared during the Song period which is also referred as pilgrimage vase. These flasks were potted without a foot-ring.

![Ch’ing-pai porcelain: Ewer with lugs (source: Ashmolean Museum, University of Oxford)](image1)

The porcelain industry made significant changes in the Yuan period (1279-1368 CE). New porcelain forms in large sizes were originated during this period i.e. dishes with foot-ring and everted, flattened or moulded rims (fig. 2.37 on page 141); bowls with straight, inverted or everted rim, stem-cups, ewers with foot-rings, moon-flasks or bianhu (full-moon shapes with two handles), mei-p’ing or plum blossom vases (short necked elongated jars), hu lu p’ing or double-gourd flasks, kuan/ guan jars or storage jars (globular shaped big jars), square bottles, pouring bowls, etc. Other popular shapes were cups, pen rests, etc. Most of the shapes and sizes developed during Yuan period were influenced by the potteries of Persia.
fig. 2.37 Dishes with moulded and flattened rim
(source: Carswell 2000: 190)
The Yuan forms may be divided into two types - open forms and closed forms. The open form includes shapes like cups, bowls, basins, dishes and plates, etc. Amongst these, the plates and dishes have varied shapes but they have shallow wells with flattened or foliated flattened rims. The closed forms on the other hand include vases and jars, flasks, ewers and bottles (fig. 2.38-2.39).

During the Ming period (1368-1644 CE), porcelain in big shapes and sizes continued to be manufactured along with the small tea-cups, small plates, bowls. The period is marked by the hexagonal shaped covered boxes, basin, pen rest, candle stands, sculptures, etc. Some significant shapes showing the development in shapes and sizes are worth mentioning like 16th century Swatow and *Kraakporselein* dishes having flattened edge; *lien-tzu* or lotus bowl made during the Yung-lo reign and later;
foliated) stem cups produced during the Hsuan-te reign and further; cha-tou or leys jars having wide flaring rim and splayed foot commonly used as spittoon; pen rests made during the Cheng-te period in the shape of five mountain peaks (fig. 2.40), etc. (Macintosh 1977: 11-14).

Most of the blue-and-white porcelain wares produced during the reign of Yung-lo and Hsuan-te seems to be influenced from the Persian metal objects but the decoration done on them was Chinese in nature (Gray 1963: 17).

The shapes developed in the Ch’ing period (1645-1911 CE) were small dishes, jars with elongated and short necks, straight jars, covered jars, square-vases, sculptures of Chinese gods, mythical animals, etc. The popular shapes developed during this period were - tall rouleau vases made during the K’ang-his reign; and yen-yen or baluster vases which were as tall as 2 feet (Macintosh 1977: 14).

**Paintings and Decorations**

The tradition of decorating potteries with several motifs and designs started in China right from the Neolithic period. The earliest pottery in China comes from Henan and Shensi provinces which had light brown coloured sandy bodies with cord-impressed or incised designs (Valenstein 1975: 2). During the late Neolithic culture, some new varieties of pottery developed - fine red or buff coloured earthenware with painted designs; black earthenware; burnished black earthenware; white earthenware, etc. Earthenware of Neolithic cultures developed into glazed stoneware during the Shang period (2000 BCE). The invention of bronze utensils with moulded designs also took place during the Shang period. Same as the bronzes, the potteries were also decorated with moulded designs of meander, lozenges, and zoomorphic patterns (Li 1996: 30).
The Shang was followed by the Chou/ Zhou dynasty which used advanced technologies for making bronze utensils and ceramics. During this time, most of the ceramics were produced specifically for funerary purposes. These wares were red in colour, coarse and had decorations of cord impressed or geometric patterns. Other popular decorative motifs on pottery were impressed basket weave, square, comb and chevron designs along with appliqué s-shaped motifs (Li 1996: 32). In 3rd century BCE, the Ch’in dynasty, which lasted only for 15 years, continued the production of glazed wares. After Ch’in dynasty, the Han dynasty conquered China and acquired a large territory. The ceramic industry progressed under them and the techniques like cutting, incising and moulding were used for decorating ceramics. Floral and geometrical designs were commonly found on the ceramics of Han period. The tradition of funerary ceramics started in this period. The ceremonial glazed stoneware of Han period were decorated with designs like waves, clouds, animal motifs, etc. (Li 1996: 45).

After the decline of Han dynasty, the China was ruled by six successive dynasties for short periods between 222 and 589 CE. This period is known as the six dynasties. The ceramic production remained an integral part at this time. The influence of bronzes continued on ceramics and decorations were done using the ways of incised, impressed and moulded designs. Stoneware with glazed bodies in green colours became popular. Geometrical designs along with floral, birds and animals motifs were commonly found on the ceramics of this period (Valenstein 1975: 36). After the six dynasties, a short-lived dynasty namely Sui (581-618 CE) ruled over China. The ceramics of Sui period showed moulded patterns on stoneware over which refined and translucent glaze was applied. The wares of Sui period were high-fired and had whitish bodies. The potteries of this period show the influence of Central Asia in designs like Persian musicians playing instruments and dancers; spring moulded decorations of rosettes and trees, etc. Other popular moulded designs found on the pottery of Sui period are lotus petal bands, animal heads, etc.

After the collapse of Sui dynasty, the T’ang dynasty came to power in 7th century CE. The T’ang rulers preferred extensive contacts through trade with the overseas countries. The influence of foreign designs along with Chinese motifs was clearly

144
visible on the ceramics of T’ang period. The Persian motifs, horsemen or rosettes in relief on glazed ceramics especially ewers were largely used (Gray 1963: 13).

The customs of producing funerary ming ch’i (clay animals) and potteries continued. The qualities of those ceramics drastically increased which were specifically manufactured for the king’s tombs.

Natural forms of decorations were found on the pottery of T’ang period such as plants, clouds, mythical birds like phoenix, dragons, flowers exclusively lotus, chrysanthemum, etc. These designs were generally made by incising. Glazes of different colours such as green, white, red, yellow, black, blue, etc. were used for decorations on the ceramics. In the late T’ang period (8th-9th century CE), the white porcelain originated which was an extremely refined high-fired ware. The early white porcelains were either left plain or decorated with incised, carved, mould impressed, beaded designs.

After the decline of T’ang dynasty, the five successive dynasties ruled over China till 960 CE. The period is marked by incised and moulded designs of dragons, clouds, lotus petals, etc. Combed lines were also found on some of potteries. After five dynasties, China was conquered by the Song dynasty. The ceramics of Song period especially celadon and porcelain were decorated using incised, combed, carved, moulded and applied-relief designs (Valenstein 1975: 68). Floral motifs are the most frequently used on Song porcelains. The designs like phoenix flying amongst clouds, lotus and chrysanthemum flowers, ducks, fishes, plants like bamboo, human figures, etc. were generally found on the ceramics of Song period.

After Song, the Yuan dynasty, a Mongolian tribe, conquered China in 1279 CE. During this period, a wide range on decorations and designs were noticed on porcelain some of which were never seen before. The Persian designs and motifs made on textiles were painted on porcelain. A variety of painted motifs both of Chinese and Persian origins especially in cobalt blue colour on white base were found on the porcelain of Yuan period. The designs painted on porcelain include animals, flowers, plants, birds, scenes from popular Chinese stories and fairytales, geometrical motifs, etc. Earlier
techniques of decorations like combed and incised became less popular but moulded techniques continued. Decorations under the glaze using red colour was also found on the porcelain of this period.

In 1368 CE, the Yuan dynasty declined and once again China was ruled by the native Ming. During this period, the painting of different motifs on porcelain continued. The colours used for decorations were green, blue, red, yellow, black, etc. The porcelain of Ming period became more Chinese as designs and scenes from Chinese history and folklores, landscapes, flowers, dragons, precious symbols, Taoist motifs became extensively popular.

In 1644 CE, a new dynasty developed known as Ch’ing came to rule over China. During the initial years of Ch’ing period, the painted motifs of Chinese origin such as flowers depicting Chinese months, scenes from folklores and history, birds, landscapes, etc. remained popular. The popular designs of Yuan and Ming period were also copied during the Ch’ing period but they became less naturalistic. The celadon wares of this period were decorated using moulded and incised designs. The Ch’ing period ended in 1911 CE.

Decorative Motifs

Innumerable motifs were used for decorating porcelain from the T’ang period. These motifs can be classified as flowers and plant; faunal; mythical creatures; religious symbols; and miscellaneous. These motifs were inscribed, moulded and painted on porcelain.

Flowers and Plants

Chinese potters decorated porcelain by using different flower motifs in a supple and graceful manner. The Song period was termed as golden age of floral and plant motifs
on porcelain which continued through Yuan, Ming and Ch’ing dynasties with major and minor changes (Koehn 1952: 121). Certain flowers in Chinese art depict every month of the year (Hobson 1915: 295-296). Prunus, peach, tree peony, double cherry, magnolia, pomegranate, lotus, pear, mallow, chrysanthemum, gardenia, and poppy symbolise twelve months of the year.

Prunus - *Mei hua* (wild plum or prunus) represents winter season and symbolises long-life and immaculate beauty. Prunus (*Prunus mumei*) is a white or pink coloured five petalled flower depicting the month of January. It is a native flower of Central China and Japan (Koehn 1952: 127). It was first painted on Yuan period’s blue-and-white porcelain (fig. 2.41) and continued to be painted till Ch’ing period. This flower was frequently painted on blue-and-white porcelain, red-and-white and enamelled wares. It is depicted in three different styles on porcelain, as climbing, hanging and clustered prunus (Tredwell 1915: 19).

Peach - *T’ao* (peach) symbolises luck, longevity, happiness and good fortune in Chinese art. It is found in three different forms on porcelain - flowers, fruits and tree. Peach (*Amygdalus persica*), a pink coloured flower represents the month of February. The peach fruit is orangish-red in colour which represents long-life or immortality and the peach tree resembles longevity.

The flowers of peach are occasionally found on porcelain but the peach in fruit form is commonly noticed especially on the porcelain of Ming and Ch’ing periods. It is sometimes found painted together with pomegranate which symbolises fertility.
Peony - *Mu tan* (peony) is a flower of spring and symbolises wealth, love and compassion. Peony (*Paeonia mutan*) is a pinkish-white coloured flower which is of globular shape and represents the month of March. The depiction of peony on porcelain started during the Yuan period (fig. 2.42) and continued till Ch’ing period. The depiction of peony scrolls on Yuan pieces is generally found together with flying phoenix, a mythical bird. It is also commonly found moulded on the celadon ware of Yuan period. In 1903, during the Ch’ing period, Peony was declared as a national flower of China. It is a flower of riches or honour and also depicts higher social status and rank.

Double Cherry - *Ying t’ao* (double cherry) represents the month of April and symbolises feminine beauty. Double Cherry (*Prunus pseudocerasus*) is a pinkish-white flower with clustered petals. It is found on the porcelain of Yuan and early Ming periods.

Magnolia - *Yu lan* (magnolia) symbolises feminine sweetness and beauty. Magnolia (*Magnolia yulan*) is a fragrant flower with long petals in pink colour and represents the month of May. The flowers of magnolia were found painted on porcelain of Ming and Ch’ing periods.

Pomegranate - *Shih liu* (Pomegranate) is depicted on porcelain both in the form of a fruit as well as flower. The pomegranate being a seeded fruit symbolises fertility. The flower of pomegranate (*Punica granatum*) is bell shaped (fig. 2.43) and deep red in colour and depicts the month of June. It is not a native species of China. In 126 BCE, Zhang Qian brought it from *An Shiguó* (now Kabul) after which its cultivation in China started (Williams 2006: 321). In art, this fruit is depicted half-open.
and its flowers are also found to be painted on porcelain. The depiction of pomegranate flower was commonly found on the blue-and-white porcelain of Yuan and Ming periods. The representation of pomegranate is noticed on the porcelain of Ming and Ch’ing periods. It is also depicted with two other fruits, peach and finger citron where these three fruits symbolises abundance of years, sons and happiness (Hobson 1915: 296).

Lotus - The flower lien hua (lotus) (fig. 2.44) was regarded precious being associated with Buddhism. It is a flower of summer and symbolises purity, being so beautiful and stainless, yet rising from mud (Koehn 1952: 136). Red lotus (Nelumbium speciosum), most commonly found flower in Chinese art depicts the month of July.

The portrayal of lotus on porcelain started as early as T’ang period where the petals of lotus were incised, carved or moulded on the ceramics. During the Song period (960-1279 CE), the depiction of lotus became common and it is generally found incised or moulded on celadon ware. Lotus was found painted with spiky petals on the porcelain of Yuan period. It was painted as scroll on blue-and-white porcelain or either found decorated together with grapes, banana tree, morning glory, etc. The depiction of lotus pond with mandarin ducks is the most common decoration on blue-and-white porcelain pieces of Yuan dynasty. Its depiction is continued to be found on the porcelain of Ming and Ch’ing period.

Pear - Hai t’ang (pear) symbolises purity, justice, longevity and benevolent administration. Pear (Pyrus spectabilis) a white coloured flower having small petals represents the month of August.

Mallow - Ch’iu k’uei (mallow) is a yellow flower of bell shaped which depicts the month of September. Mallow (Malva verticillata) is often found on Chinese porcelain of early Ming period.
Chrysanthemum - *Chū* (*Chrysanthemum*) (fig. 2.45), also known as China aster is a native flower of China which represents the month of October. It is also commonly known as Daisy. The flower of chrysanthemum symbolises longevity, joviality and endurance (Koehn 1952: 143). Chrysanthemum (*Chrysanthemum indicum*), a golden coloured flower with clustered petals depicts autumn season. Its earliest representation was noticed during the T’ang period. It is continued to be decorated on the celadon and porcelain of Song, Yuan, Ming and Ch’ing periods. It was generally painted as fully blown. The depiction of Chrysanthemum on Yuan period’s blue-and-white porcelain looked more naturalistic as compared with the depictions in late Ming and Ch’ing periods. It is also depicted on the red-and-white porcelain.

Gardenia - *Chih hua* (gardenia) is white fragrant flower. It represents the month of November. *Gardenia florida* is depicted on Yuan’s period blue-and-white porcelain.

Poppy - *Ying su* (poppy) is a maroon or red coloured flower. It is a flower of the month of December. *Papaver somniferum* is not a commonly depicted flower on porcelain. It was painted on the porcelain of Yuan and Ming periods.

The other general varieties of flowers noticed on porcelain include Narcissus (*Narcissus tazetta*), Camellia (*Camellia sinensis*), Crape-myrtle/*myrtle* (*Myrtus tomentosa*), Hibiscus (*Hibiscus rosa-sinensis*), Hollyhock (*Alcea rosea*), Day lily (*Hemerocallis fulva*), Carnation (*Dianthus caryophyllus*), Jasmine (*Jasminum*), blackberry lily (*Belanuanda chinensis*), Morning-glory (*Ipomoea purpurea*), etc. The depiction of floral motifs sometimes looked highly stylised and imaginary which often create difficulty in determining their species properly (Williams 2006: 200).

*Jinzhān yǐntāi* (narcissus) is a bulbous plant with white or yellow scented flowers and cup-shaped centre. It blooms in spring with narrow leaves. Chinese called it as water fairy (Williams 2006: 285). Its flower blossom at the New Year and it depicts good fortune. In Chinese art, this flower always depicts genii of the Taoist Heaven
i.e. bringers of great happiness (Koehn 1952: 129).

Camellia is a rose shaped red flower with evergreen leaves. It is commonly known as mountain tea in China (Welch 2008: 23). It is a winter flower and indigenous to China. The flower symbolises endurance as it stands strong during harsh winter season.

Crape-myrtle/myrtle is an evergreen wild plant having fragmented white or pink flowers and blue-black fruits. It is native to the regions of Mediterranean and western Asia. The flower is commonly found painted on the rim portion of blue-and-white porcelain of Yuan period. Its depiction also continued during the Ming period.

*Furong* (hibiscus) also known as rose mallow is a bush plant having large red, white or bright pink coloured flowers with prominent stamen tubes. It is a perennial plant which belongs to the mallow family. It symbolise happiness and honour.

Hollyhock (fig. 2.46) is a tall plant with hairy stems and deep burgundy or purple coloured flowers. It is a native of southwest China. It is often found painted on the porcelain of Yuan and Ming periods.

*Xuāncāo* (day lily) is a plant with yellow, red, or orange flowers and long slender leaves. It is a perennial plant which blossoms in summer. The plant is indigenous to Asia. Its flower symbolise peace and love.

Carnation (fig. 2.47) is a plant of scented white, pink, or red coloured fringed petals flower. It is a perennial plant. It is depicted on the porcelain of Yuan and Ming periods.

*Mòlíhua* (jasmine) is a climbing plant with fragrant white, yellow, or red coloured flowers. The flower is not native to China, it was brought from Persia. It is an emblem of the fair sex and depicts sweetness (Williams 2006: 240).
She-gan (blackberry lily) is also known as Leopard flower because of its orange coloured petals with dark brown, red or black spots. Sometimes its black seeds clustered together like small blackberries are found with the flower. Blackberry lily (*Belamanda chinensis*) is native to Central Asia, India and China. This small petalled flower is generally found to be painted on Yuan and Ming period’s blue-and-white porcelain dishes. These were painted as borders on large moulded rims of dishes of Yuan period.

Qianniu (morning-glory) (fig. 2.48) is also known as bindweed. It is climbing plant with purple or pale-blue bell or trumpet shaped flowers that opens in the morning and closes in the afternoon. Morning-glory (*Ipomoea purpurea*) is native to East and Southeast Asia and cultivated in tropical climate. It depicts bonding in love and marriage (Welch 2008: 22). This flower is generally found painted in the centre along with other plants on blue-and-white porcelain variety of Yuan period. It is represented in the cavetto portion on the dishes of blue-and-white, and red-and-white porcelain of Ming period.

Other than the flowers, there are certain noteworthy varieties of plants which have been noticed on the porcelain such as pine, bamboo, banana, grape, and water-melon.

Banana, Grape and Water-melon - These three plants are commonly found together in landscape scenes painted in the centre of porcelain dishes and bowls of Yuan period. The decorations of jiao (banana) (fig. 2.49), grape and water-melon have been noticed on some of the dishes and bowls of Yuan period blue-and-white porcelain from Ardebil Shrine, Iran and Topkapi Saray, Istanbul.

Pine and Bamboo - Chinese potters also painted the sung shu (pine) symbolising pure life and chu-tzū (bamboo) symbolising longevity on porcelain. These are generally
depicted together in the landscapes. Pine is an ever-green plant which shows endurance (fig. 2.50). Bamboo is represented as a graceful plant with slender leaves on the porcelain of Yuan, Ming and Ch’ing periods. It represents peace and tranquillity when painted alone on porcelain (Koehn 1952: 134).

The depiction of plant and floral motifs has also been found on the base of porcelain in the form of marks or symbols. Tradition of making a mark or emblem of the motifs of plant, flowers, fruits, etc. started during the Ming period. Commonly used marks were peach, lotus spray, prunus flower, lingzhi (ling-chih ts’ao) fungus, chrysanthemum, acanthus leaf, double fish, etc. (Monkhouse 1901: 149-150). Amongst these, marks like acanthus leaf, lingzhi fungus and prunus flower are noticed on Ming and Ch’ing blue-and-white porcelain.

Animals

Animals include mammals, birds, reptiles, amphibians, fish and insects are generally painted on porcelain. Among birds, gōngjī (cock), k’ung ch’iao (peacock), swan, guàn (stork), duck, crow, què (sparrows) are prominent. Mammals include lu (deer), mao (hare), ma (horse) and shih or shih tzǔ (lion), hu (tiger) (Medley 1976: 180). The reptiles include lizard, scorpions, snakes, etc. Amphibians such as frogs and toads, fishes of marine and fresh water, and insects like mantis, butterflies, etc. are some commonly decorated motifs on porcelain.

The twelve animals representing zodiac signs are also depicted on porcelain, these are - dragon, hare, tiger, fox, rat, pig, dog, cock, monkey, goat, horse and snake (Savage 1954: 77). Their occasional depiction on porcelain started during the Yuan period but they came into common use in the later periods of Ming and Ch’ing.

Depiction of two or three deer playing in the jungle is common and found on porcelain dishes. Depiction of a prancing deer under a moon is a typical Ming period feature which is generally found painted on blue-and-white porcelain bowls and dishes.
Depiction of hundred deer surrounded by mountains, water-falls, peony, prunus and bamboo trees is also commonly found on porcelain jars of Ming period.

Depiction of the Lion on porcelain meant the Lion of Buddha (Fo). The Lion is associated with Buddhism not only as a symbol of royal power but also as a guardian of the religion (Welch 2008: 244). The earliest depiction of Lion of Buddha is noticed on the blue-and-white pieces of Yuan period. It continued to be painted during the Ming and Ch‘ing periods though in less refined form.

Horse and hare are occasionally found painted on porcelain. Horse (fig. 2.51)’ in Chinese tradition represents swiftness and wisdom (Gulland 1902: 88) and hare (fig. 2.52) when portrayed with moon, depicts a symbol of sacredness and intelligence (Gulland 1902: 86). They are occasionally painted on the porcelain of Yuan period but were frequently painted on the Ming period’s porcelain.

The depiction of tiger is widely found to be painted on porcelain. In China, it is regarded as lord of the land animals and symbolises military power. Animals in Chinese art also represents directions - white tiger represents the west direction, dragon represents east, phoenix represents south and tortoise represents north (Savage 1954: 76).
Among birds, lù (heron), zhí (pheasant), and què (sparrows) are generally found painted on porcelain of Yuan and Ming periods. Depiction of a guàn (stork) in a lotus pond is noticed on the porcelain dishes and bowls of Yuan and Ming periods. Ducks especially yuan yang (mandarin ducks) (fig. 2.53) are first depicted on the porcelain of Yuan period. These are found floating together in a lotus pond or sometimes the male duck was depicted chasing the female duck in a pond. The depiction of yuan yang symbolises marital fidelity and happiness. The depiction of k’ung ch’iao (peacock) (fig. 2.54) or peahen among watermelon and grapes shrubs is often found on porcelain of Yuan and Ming periods.

![fig. 2.53 Depiction of mandarin ducks on porcelain](source: Ashmolean Museum, University of Oxford)

![fig. 2.54 Depiction of peacock on porcelain](source: Krahl 1986: pl 577)

Reptiles are also depicted on porcelain both moulded and painted. Scorpions, snakes and lizards are some common motifs. Amongst these, the lizard was assumed as the protector of the palace (Williams 2006: 195). These were generally found to be decorated using moulded techniques on the lids on the celadon jars or outer body. The scorpions generally painted in four or five numbers are found encircling the fish in middle. This is a common depiction found on the pieces of Ming period.

Fishes of different species are found painted on blue-and-white, red-and-white, enamelled ware porcelain, etc. of Yuan, Ming and Ch’ing periods. The twin fish motif is also found moulded on celadon ware of Song and Yuan periods. Yù (fish) in a pond
surrounded by aquatic plants symbolises abundance. Popular motives include marine fish of Sea perch family, and fresh water fishes (carp). The gold fish with large eyes were also depicted on porcelain which symbolises good fortune and wealth (Muhammed 1994: 184) Depiction of fish on porcelain was often associated with Buddhism. Generally fish symbolises as the emblem of abundance and also harmony and matrimonial bliss (Williams 2006: 185). The most commonly painted fishes on Chinese porcelain are carp and perch (Williams 2006: 184).

Depictions of insects like mantis, grass-hoppers, butterflies, etc. are also occasionally found on the blue-and-white porcelain of Ming and Ch’ing periods.

**Mythical Creatures**

Among mythical creatures painted on porcelain, *fēng huang* (phoenix), fabulous beasts such as the *lin* (kylin), and *chʻên* (dragon) are prominent (Medley 1976: 180). Phoenix, an original Chinese innovation is largely found on blue-and-white porcelain generally in a pair flying amongst sprays of lotus and spiky leaves. Phoenix when painted alone is regarded as the empress. A bird having the head of a pheasant, a long, flexible neck and a plumed tail may often be seen flying amongst the scroll-like clouds, or walking in a grove of tree-peonies. These are known as *fēng huang*, the Chinese phoenix, emblem of immortality.

Depiction of *lung* or five clawed dragon is a symbol of a powerful emperor, while four or three clawed dragons represent the nobility. Three different kinds of dragons are found on porcelain - the *lung* of the sky, the *li* of the sea, and the *kiau* of the marshes (Mcl. M 1907: 181).

*Chi-lin* or Qilin, a mythical creature in Chinese art is shown with the head of a dragon, a scaly body, deer’s hooves, a bushy tail and a single horn. Its appearance is always portrayed during some auspicious event. It symbolises good government when painted on a vase or ornaments (Mcl. M 1907: 182).
Religious Symbols

Three principle sects in China were the Confucianism, Taoism and Buddhism of which several religious symbols were often painted on porcelain. Taoism was more popular in China than Buddhism and Confucianism. The popular motifs of Taoism are the eight immortal Genii which can be recognised by their respective symbols, the fan (or fly-whisk), the sword, pilgrim’s gourd, casteners, basket of flowers, bamboo tube and rods, flute and lotus flower (Mcl. M 1907: 182). The most frequently painted immortal amongst the eight immortals is Lao-tzū depicted with a large protuberant forehead (Savage 1954: 72).

Besides the eight immortals, there are *pa pao* or eight precious objects in Taoism which were commonly painted on blue-and-white porcelain of Yuan and Ming periods (Bushell 1906: 54-55). Generally these eight precious symbols (fig. 2.55), *chueh* (Rhinoceros horn cups), *ch’ing* (musical stone of jade), *ai-yeh* (Artemisia leaf), *chu* (a jewel), *ch’ien* (a coin), *hua* (a painting), *shu* (a pair of books or tablets), *fang shêng* (lozenge or symbol of victory), are found decorated together with the Buddhist emblems (Bushell 1906: 54-55).

![fig. 2.55 Eight precious symbols](source: Savage 1954: 78)
During the Sui period (581-618 CE), Buddhism had gained huge popularity in China and as a result the depiction of Buddhist deities, emblems and symbols were commonly included in Chinese art. The Sui rulers tried to follow Buddhism along with the promotion of Confucian values. Construction of temples and monasteries were encouraged by the Sui rulers and the lotus flower of Buddhism became an important motif on all the artifacts including Chinese ceramics (Vainker 1991: 60). The tradition continued to be followed during T’ang period (618-906 CE) and the lotus design was either moulded or incised on Chinese celadon wares. The tradition of decorating Chinese porcelain with Buddhist emblems and motifs continued till the Ming and early Ch’ing periods.

Amongst a number of Buddhist designs and motifs on Chinese porcelain the commonly found were pa chi-hsiang or the eight Buddhist emblems (Savage 1954: 74-75).

These are (1) Lun, a flaming wheel of the law - the ever-turning wheel of transmigration of the soul which also symbolizes the Buddhist teachings; (2) Lo, a conch shell - a wind instrument used at religious ceremonies which represents voice of Buddha’s calling people to worship; (3) San, a state umbrella - a symbol of monarch which represents spiritual authority and shelter to all living beings; (4) Kia, a canopy - symbolizes charity; (5) Hua, the lotus - the most frequent of all Buddhist symbols, an emblem of purity and enlightenment; (6) Ping, the vase - represents the water of life which means abundance and prosperity; (7) Yu, a pair of fishes - symbolizes tenacity and connubial felicity; (8) Ch’ang, the endless knot - symbolizes longevity and eternity, the knot also symbolizes cyclical change of everything.

Besides the eight emblems of Buddhism, by far the most popular figure of the Buddhist theology in China is Kuan-yin, the compassionate deity seen commonly holding a child in her arms (Hobson 1915: 110). This figure is occasionally found on Chinese porcelain but commonly moulded in bronzes and painted on silk thankas.

The other famous depiction is that of Sakyamuni in various poses. He is depicted in five different manners i.e. (1) as an infant standing on the lotus and proclaiming his birth; (2) as an ascetic returning from his fast in the mountains; (3) seated cross-legged
on a lotus throne with right hand raised in teaching attitude, the most frequent representation; (4) recumbent on a lotus pillow, in Nirvana; (5) in the Buddhist Trinity holding the alms bowl or *patra* between the Bodhisattvas Manjusri and Samantabhadra (Hobson 1915: 284-286). He is often found painted on Chinese porcelain of Yuan and Ming periods.

Other than *Sakyamuni*, the eighteen Lohan (Arhats), disciples of the Buddha, were also depicted in the form of sculptures and even painted on porcelain of Yuan and Ming periods. *Bodhidharma* was one of the eighteen Buddhist disciples who remained in contemplation for nine years in China. He is usually represented on porcelain in the act of crossing the River Yang-tse on a reed, an incident of his journey from India.

The Lion of Buddha (*Fo*), is often painted and also modeled as sculptures. Sometimes mistakenly, they are also referred to as *Chi-lin* or Kylin which is a different mythical creature with the head of a dragon, a scaly body, deer's hooves, a bushy tail and a single horn. The Lion of Buddha is associated with Buddhism not only as a symbol of royal power but also as a guardian of the religion (Welch 2008: 244). Its depiction on porcelain is noticed from Yuan to Ch’ing periods.

Miscellaneous

Folklore and stories related to different Chinese gods were also painted occasionally. These pots were prepared for the specific use and not for export. The human figure is rarely noticed in decoration on the porcelain prior to Yuan period. The depiction of human figures on porcelain increased during the Ming and Ch’ing periods as narrative scenes were commonly painted.

Besides the main central motifs, different geometrical and non-geometrical patterns were executed on the rim portion of porcelain.
These decorations include designs like diamond diaper, classic scroll, meander, concentric (fig. 2.56) and serpentine wave patterns (fig. 2.57), etc. Amongst all these designs, meander pattern was most commonly used as border motif which is described by the Chinese archaeologists as *lei-wên* or “cloud and thunder pattern” (Hobson 1915: 301). It is sometimes varied by the inclusion of *wan* (*swastika*). In technical terms two varieties of borders, i.e., narrow and wider borders, have been noticed on porcelain. The narrow borders generally depicts zigzag pattern with diagonal hatching and the ordinary diaper designs while the wider borders are usually borrowed from brocade patterns with geometrical or floral ornament (fig. 2.58), broken by three or four oblong panels containing symbols or sprays of flowers. Even though, border designs on porcelain are comparatively few in number but they perfectly complement the main decoration.

![fig. 2.56 Concentric wave pattern on porcelain](source: Pope 1956: pl 15)

![fig. 2.57 Serpentine wave pattern on a porcelain dish](source: Pope 1956: pl 19)

![fig. 2.58 Diamond diaper pattern on rim of a porcelain dish](source: British Museum, London)

Other than these, symbols like *ting* (four-legged incense burner); *fu* (mark depicting happiness); *fu shou shuang ch’uan* (bat and two peaches symbolising happiness and longevity); *pi ting ju i* (brush-pencil, a cake of ink, and a jade sceptre read as “may it be fixed as you wish”) are also noticed on the porcelain of Ming and Ch’ing periods (Bushell 1906: 56-57).
Inscriptions

The tradition of painting inscriptions on porcelain was started during the T’ang period, though its use was restricted to selective pieces. Pieces for export purposes were never marked or inscribed during this period and in the following periods of Song and Yuan dynasty.

Up till the Yuan dynasty, inscriptions were rarely found on porcelain. Generally pieces of porcelain bearing inscriptions in Chinese were specifically prepared for the temples or palaces in China. Such inscribed porcelains were not exported outside China. The Chun-chou porcelain (in Guangdong) was sometimes marked with an engraved numerals and a palace mark of shu and fu (the privy council) (Burton 1912: 127). These two characters generally found on the inner side of bowls and dishes were inscribed in relief under the translucent glaze. Several such porcelain are preserved in the British Museum, London; The Metropolitan Museum of Art, New York, etc.

Besides the inscribed marks, the painted inscriptions have only been found on two blue-and-white porcelain vases of Yuan period. These two exceptional vases, popularly known as the David Vases are the significant examples of painted inscriptions in Chinese (fig. 2.59). The inscription on it is a dedication which reads as - a man named Zhang Wenjin from Yushan county gifted

![fig. 2.59 David vase: Chinese inscription](source: British Museum, London)
these vases and an incense burner to a Daoist temple in Xingyuan (modern Wuyuan) in 1351 CE (Medley 1976: 177-178). The vases at present are on displayed in the porcelain gallery of the British Museum, London.

In the Ming period (1368-1644 CE), inscribing reign or dynastic marks on the base of the porcelain dishes, bowls, etc. became a practice. No such dynastic inscriptions are found on the porcelain prior to the Ming period. Every Ming and Ch’ing ruler had specific dynastic marks which were painted on almost all the porcelain pieces. These inscriptions were made either by painting in blue and red under the glaze or by using a stamp seal bearing the impression of the reign mark. The inscriptions were also painted on the glaze in red, black and gold colours. Mostly the characters were arranged in parallel columns and read from top to bottom with right column first (fig. 2.60) (Burton 1912: 129).

![fig. 2.60 A dynastic mark in Chinese read from top to bottom with right hand column first](source: Burton 1912: 129)

The characters were sometimes painted inside double circular ring or square borders (fig. 2.61). The dishes and bowls of porcelain generally bear inscriptions inside the foot-ring of the base. The other forms such as vases, jars, ewers, etc. bear inscriptions on the neck portion. Sometimes inscriptions are found at more than one place on a piece of porcelain.

![fig. 2.61 Dynastic mark of Wan-li reign](source: British Museum, London)
The inscriptions in Chinese found on porcelain are divided into five types which are dynastic, cyclical, complimentary, pictorial and lines from poetry or popular romances.

Reign or Dynastic Inscriptions

The common practice of inscribing or painting official reign marks came into vogue during the Hsuan-te reign of Ming dynasty between 1426-1435 CE (fig. 2.62-2.63). The dynastic inscriptions are generally found having four to six Chinese characters. The inscription with four characters represents the name of the dynasty or the period. If the first two characters name the dynasty only, then the last character will be either chih or ts’ao, the first means ‘made to imperial order’, the second simply implies ‘manufactured’, and it may occur on a piece made anywhere (Medley 1976: 214). The early dated inscriptions appeared in heavy strokes and the characters are written closely inside the foot-ring or base. But these marks cannot entirely be used for dating a porcelain piece as for example the marks used during the period of emperor Hsuan-te of Ming dynasty was copied in later periods also.

Cyclical Inscriptions

The cyclical inscriptions denote one year within a recurring sixty years cycle (Krahl 1986: 110). The Chinese cyclical dates were assumed to start from 2637 BCE and the combined sixty years were given separate signs which are also zodiac marks (Burton 1912: 129). These marks can be found with the dynastic inscriptions or without it. When a cyclical date is included in the inscription, sometimes it makes the total up to eight characters.
Complimentary Inscriptions

Another group of inscribed marks are the complimentary inscriptions generally consist of complimentary phrases such as commendation, good wishes, hall-marks, etc. Such marks appeared in the second quarter of the 16th century CE. During the Ming period, phrases of four to six characters containing good wishes were inscribed, while in the Ch’ing period, the hall-marks often in one or two characters became more popular (Krahl 1986: 110-112). Common marks used for complementary purposes were - xi (happiness) or shuangxi (double happiness) marked in pair is usually connected with marriage, shou (longevity), ji (good fortune, lucky, auspicious) fu (good fortune, happiness) also represented by the pictorial depiction of a bat, etc.

Pictorial Marks/ Inscriptions

On the porcelain of 16th-17th century CE, the pictorial marks are commonly painted which includes plants, animals and birds. These small drawings were made on the foot-ring or base therefore it is uncertain whether these were for decoration purpose or had some meaning. Figures like white hare (fig. 2.64), egret, lotus, peach, twin fish, lingzhi, endless knot, etc. were commonly painted under the glaze (Burton 1912: 138-141). These marks sometimes depict religious symbols also i.e. Buddhist and Taoist marks.

fig. 2.64 A pictorial mark of white hare on porcelain (source: British Museum, London)

Poetry and Popular Romances

The porcelain was often used for painting some important events of Chinese history along with inscriptions. Generally lines from the popular Chinese poems were found to be painted on porcelain dishes and bowls. Historic scenes were also painted on porcelain along with inscriptions for narrating the event. Popular lines from the poets of Song and Yuan period’s are often found on porcelain.
One interesting example of poetry on a blue-and-white porcelain dish discovered from the Wanli shipwreck, datable to Ming period, states - Lo hung mooring at night by Chibi, 500 years before the victory tour, water is still floating, wandering the night dusk fell (fog), like (trance), union movement of autumn that year (fig. 2.65). The lines were written by poet Luo Hongxian of 16th century CE.

Similar example of bearing lines from a Chinese poem has also been noticed on a blue-and-white potsherd discovered from Purana Qila, Delhi. The lines are taken from the last paragraph of a poem from Song period “Former Ode on the Red-cliff” written by Su Shi Song that talks about the dream of a man who is returning back to his home along with two guests after the end of the war on the red-cliff.

**Non-Chinese Marks and Inscription**

Other than Chinese inscription, the non-Chinese inscriptions have also been found on porcelain. The non-Chinese inscriptions are found in Arabic, Tibetan, Lantsa, Devanagri, Portuguese, etc.

The painted inscriptions in Persian or Arabic on Chinese porcelain began during the reign of Cheng-te in the early 16th century CE (Valenstein 1975: 147). Generally these inscriptions were found on the blue-and-white porcelain bowls, dishes and pen-rests.

These porcelain types inscribed with Arabic inscriptions were also popularly known as the ‘Mohammedan ware’. Unlike Chinese dynastic marks, the Arabic inscriptions of Cheng-te period were painted only for decoration purpose and beautifying the porcelain. The idea behind the painted Arabic inscriptions on porcelain was to show the power of Muslim eunuchs in the Cheng-te court. The Arabic inscriptions are also found on the porcelains of Wan-li period.
Inscriptions in Tibetan and lantsa or lança script painted under the glaze both on the inner as well as outer side of the porcelain dishes or bowls have been found at Topkapi Sarai in Istanbul (fig. 2.66) and Ardebil Shrine in Iran. Such inscriptions have also been found on the potsherds discovered from Champaner in Gujarat. Mainly the blue-and-white porcelains were inscribed with the characters of lantsa script. These characters representing Buddhist mantra has a close affinity with devanagari.

The script of lantsa developed around 15th century CE and got popularised in Nepal and Tibet for writing Buddhist prayers and texts. The single characters known as seed symbols or characters i.e. bija-mantra is often found painted on textiles and porcelain which represent the Buddha or bodhisattva (Welch 2008: 216).

During the Ch’ing period, a change in porcelain varieties, decorations and inscriptions was noticed. It was because of the European influence. As per the demands of Portuguese and later Dutch, the Chinese potters painted inscriptions on porcelain. The blue-and-white porcelain decorated with the ‘coat of arms’ along with the inscription in the Portuguese or later in French were specifically on high demand in Europe.
Kiln Sites

The kiln sites producing porcelain in China are divided into two parts - north and south (map 1-2). The northern kilns developed first specifically at Hebei, Shanxi, etc. but due to constant attacks from invaders they could not continue after 10th century CE. It was during the Southern Song period when the kilns in south China started developing especially at Guangdong, Fujian, Zhejiang, Jianxi, etc. The progress of kiln sites can easily be understood period wise starting from the T’ang period.

T’ang Dynasty (618-906 CE)

The T’ang period was the golden age of China as the country was progressing in cultural, political and economical terms. T’ang rulers expanded their territory along the Silk Road going up to the Xinjiang in west and further southwest towards Tibet. They had also made policies for the trade and aimed at establishing healthy contact with foreign countries (Li 1996: 51).

During this period the ceramic industry in China grew largely as wide varieties of wares were produced essentially for export purposes. Porcelain started gaining attention of foreign as well as local markets. The T’ang wares reached East Asia, Southeast Asia, Western Asia and on the coast of Indian Ocean (Li 1996: 52). A poem of T’ang period, Cha jing (Tea Classic) written by Lu Yu mentioned about the merits of various ceramic wares including Yuezhou and Xingzhou porcelain by the colour of tea when poured in a porcelain cup (Vainker 1991: 66, 69-70).

The porcelain of white coloured glossy body originated during the late 8th century or early 9th century CE. It had a compact, hard and fine white clayey body which are essential qualities of true porcelain. It was fired on a higher temperature as compared to the stoneware (Medley 1976: 99). The white porcelain was different from the porcellaneous glazed wares of Han dynasty (2000 BCE) and white glazed stoneware of the Sui dynasty (581-618 CE). The porcelain of the T’ang period had an extraordinary thinness and refined decorative techniques such as moulded reliefs, beading and ring punching (Vainker 1991: 67-68).
Map 1: Kiln sites of north China (10th-14th century CE) (source: Medley 1976: 105)

Map 2: Kiln sites of south China (10th century CE onwards) (source: Medley 1976: 146)
The T’ang white porcelain has been found at the kiln sites in Szechwan, Shensi, Shansi, Hopei, Honan, Anhwei and Kiangsi provinces of China (Valenstein 1975: 57). During the late 8th and early 9th century CE, the maximum number of white porcelain was prepared in the kilns of Kung-hsien in Honan. These kilns produced shallow bowls with a thick rim and a low wide foot-ring along with deeper bowls and narrower foot-ring (Medley 1976: 100).

In the north China, the best white porcelain was manufactured at the kilns of Gongxian, Xing and Ding. Gongxian is located in Henan province of north China. The remains of the kilns of T’ang period have been noticed on the outskirts of Gongxian (Wood 2007: 96). Geologically being rich in limestone and fertile loess soil, the site was found to be extremely suitable for porcelain manufacturing.

The Xing white porcelain was manufactured at the kiln sites of Lingchen located in Hebei. The ware was high-fired and extremely refined. These were produced in reducing atmosphere which gave it a pure white tinge.

The Ding white porcelain was produced in the kiln sites of Beizhen and Nanzhen located in Hebei province. Its production commenced during the T’ang period but it reached at its zenith in Song period. Initially the Ding porcelain was made in similar manner as Xing. Not only in northern China, the kilns for producing finest white porcelain were also located in the Kiangsi province, both in the vicinity of Jao-chou and of Chi-chou (Medley 1976: 100).

Specific type of kilns in north China was used during the T’ang period for manufacturing porcelain. The advanced form of cave kilns which originated during Shang period were used during this time. The cave kilns in T’ang period became shorter and rounder. Two chimneys were added to control the flow of air. These kilns were locally known as mantou kilns (fig. 2.67) because of the shape of a baked bread/bun roll (Wood 2007: 95). They were also known as horseshoe type kilns because of its
ground plan with large fireboxes which looks like the horseshoe (fig. 2.68). The use of these kilns continued till the rule of Song period in the northern China.

![fig. 2.68 Mantou kilns: Plan and elevation (source: Kerr and Wood 1996: 320)](image)

During the T’ang period, the celadon wares in different glazes such as bluish-green, olive-green, brownish-green as well as pieces with polychrome sancai (tri-coloured glazes) were also produced (Li 1996: 52). Some famous celadon producing kilns of this period were located in provinces of Kwangtung, Fukien, Hunan, Kiangsi, Anhwei, Honan, Shensi and Szhechwan (Valenstein 1975: 58). Other than the celadon ware, porcelain having the decoration of blue cobalt on white surface also appeared in T’ang period. The production of this blue-and-white porcelain variety was not done on a massive scale. Earlier it was assumed that this variety was originated during the Yuan period. During the excavations at Yangzhou in Jiangsu province in 1977 and 1983, these blue-and-white porcelain types were found which had similar physical characteristics as tri-coloured glazes of the T’ang period’s Gongxian kiln (Wenwu 1977.9; 1985.10).

**Five Dynasties (906-960 CE)**

After the fall of T’ang dynasty, the period between 906 to 960 CE was a period of five successive dynasties who ruled over north China and ten independent kingdoms who ruled in the southern China. This period, known as a period of five dynasties, was turbulent for China but despite the political changes and economical imbalance, the ceramic industry managed to maintain its position (Valenstein 1975: 63). The ceramics of five dynasties are viewed as bridging the gap between T’ang and Song dynasties as they showed decorative elements of both the periods. Pottery making became more
refined during this period but the glaze had green tinge similar to T’ang pottery (Valenstein 1975: 63-64).

The white porcelain continued to be manufactured during the period of five dynasties. The remains of this variety were reported from the sites around Jingdezhen especially at Yang-meiting and Hutian (Wood 2007: 48). The white wares of this period were made in the shapes of bowls with handles and ewers with spouts having carved designs.

During the 10th century CE, the dragon type kilns developed. The structural remains of dragon kilns around Jingdezhen dated to the five dynasties period are absent. But the remnants of kiln furniture found at Liu-chia-wu and Lung-thou-shan proves the use of dragon kilns in and around Jingdezhen (Kerr and Wood 2004: 365).

The dragon kilns (fig. 2.69) developed in this region of southern China were different in design, shape and size from the earlier kilns of north China which were globular and small. The newly developed kilns were known as lung or dragon kilns because of their elongated shape and interconnected chambers. The dragon kilns were sometimes as long as 135 to 140 m (Wood 2007: 95). “The kilns were built in a series of interconnected chambers each step higher up the hillside, climbing to a considerable height; a type of construction referred to by the Chinese as dragon kilns” (Medley 1976: 147). A dragon kiln was having twelve chambers at most which could fire about 20,000 to 25,000 pieces of Chinese porcelain in one go but this is just an estimate. All the pieces of big or small size were kept in the saggars for firing.

The fire-box was located on the lower foot. The kiln was constructed in such a way that the lower most level was fired at first followed by the other upper levels. Chinese potters found easy to control fire through this way but the pieces kept in the lower
level were of inferior quality as compared to the pieces of upper levels (Medley 1976: 147-148). The lower level took less time to raise the temperature while the upper levels took constant time and firing was even. These kilns were confined to southern China only but continued for making porcelain during the Song as well as Yuan periods.

**Liao Dynasty (907-1125 CE)**

In the beginning of 10th century CE, a new empire of a nomadic tribe, Qidan came to rule over China who named themselves as Liao dynasty. The Qidan people ruled at the same time as the northern Song dynasty (Vainker 1991: 86). During this period, Chinese potters were strictly ordered to work according to the Qidan traditions (Li 1996: 127). The porcelain of this period was less refined but the Chinese potters made great efforts to copy certain Chinese skills in the pottery by using green, white, brown glazes. There were three main types of pottery - lead glazed earthenware having reddish brown surface, stoneware having red or pale greyish white surface and porcellaneous ware having hard and white surface (Medley 1976: 140). Some famous kilns of this period were traced at Longquanwucun near Beijing in Hebei province, Shangjing and Gongwayao village in Inner Mongolia (Vainker 1991: 86). The Liao rule was short-lived and evidences of porcelain trade during the period are comparatively scanty.

**Song Dynasty (960-1279 CE)**

In the late 10th century CE, Song dynasty established their rule in China. Initially the Song dynasty first ruled over a small area of northern China. During this time, the northern kilns made rapid advances in terms of porcelain manufacturing. The important kilns established in Henan province of northern China were Ru kilns at Baofeng, Jun kilns at Yuxian and Guan kilns (site is unidentified). Majorly the horse-shoe type kilns were used during the northern Song rule.

The ceramic of northern China was very refined and termed as “Classic Wares” (Medley 1976. 103). In north China, the important private kilns were Ding or Ting in Hebei, Yaozhou in Shaanxi and Jian in Fujian. Some popular types of northern
kilns were Ding wares of white transparent ivory coloured glaze and celadon wares having olive green or olive brown glazes. The Ding kilns suffered constant attacks by outside tribes. First in about 945 CE, Khitans, a nomadic tribe raided these kilns and later Jurchen Tartars destroyed it. The rule of Song in the northern China continued up till 1127 CE as Jurchen Tartars captured this region and ruled as Chin dynasty. As a result, Song rulers fled to southern China and ruled there till 1279 CE (Medley 1976: 104).

During Song period, the official kilns in the southern China were Yue kilns at Yuyao or Yuezhou and the Xiuneisi and Jiaotan kilns at Hangzhou (Li 1996: 133). These kilns were of dragon type. Besides the official kilns, there were some private kilns also which used to fulfil the demands of domestic as well as overseas markets. The major ceramic exported were southern celadon of Yue and Longquan and white wares of Qingbai (Li 1996: 133). The kilns producing white porcelain in south China were Anhui, Jiangxi, Fujian, Guangdong and Gunagxi.

In the southern Song period, the dragon kilns were extensively used in Longquan, Chekiang province. Remains of dragon kilns still survive which shows that Longquan was one of the most famous productive sites for the production of porcelain in China (Kerr and Wood 2004: 357). Dragon kilns were found in their basic styles but the kilns in the regions like Te-hua/ Dehua in Fukien province showed some advancement. The kiln in Te-hua namely Chhu-tou-kung (fig. 2.70) was about 57 m long and around 1.4 to 2.95 m wide but was abandoned in the beginning of 14th century CE. In design, these kilns were separated by partition walls and had at least 17 fuel chambers. Each chamber was connected with other through a series of opening shafts which were made at ground level. "The passage of the kiln-gases was therefore converted from the usual roaring rise up the kiln’s length, to a roller-coaster flame-path, through multiple
successive chambers, with each chamber being side-stoked in turn. The advanced design of the Chhu-tou-kung kiln forced the kiln gases to travel downwards against gravity for a large part of their journey through the kiln” (Kerr and Wood 2004: 358).

Another type of kiln developed during the Song period was gourd-shaped kiln (fig. 2.71) though its use proliferated during the Ming period. It is said to be an improved version of mantou or horse-shoe shaped kiln. Unlike other types of kilns, the gourd-shaped kilns are not in use now.

![Gourd shaped kiln: Elevation and plan](source: Kerr and Wood 2004: 367)

**Yuan Dynasty (1280-1368 CE)**

By the late 13th century, the rule of Song in southern China and Jurchen Tartars in northern China came to an end when Mongols captured the whole region. In about 1280 CE, the divided China was once again united when Mongols under the rule of Kubulai Khan captured it and named themselves Yuan. The rule of Yuan dynasty is regarded important in the development of Chinese ceramics.

During the Yuan period, the main concentration of their rulers was to gain profits from this newly seized land of China and they did the same by emphasising on the monetary benefits of trade and industry at the expense of agriculture (Medley 1974: 7). The new Yuan-style of ceramics soon took place of Song ceramics. The demand of Yuan
ceramics was soaring in foreign markets, as a result, the Chinese potters were forced by Mongols to manufacture ceramics according to the requirements and taste of buyers (Valenstein 1975: 103).

For earning large revenues from trade activities, the Yuan rulers ordered to produce different varieties of wares. The Yuan dynasty rulers were very particular about the Chinese ceramics and they had ordered to compile an appendix on the manufacturing of ceramics and its trade in about 1322 CE. This Chinese work titled *T’ao-ch‘i Lueh* translated as ‘an appendix to the ceramic record’ written by Chiang Chi is the first Chinese literary record on ceramic industry of China (Bushell 1899: 177-183). Yuan rulers appreciated the ceramic industry of China and encouraged the Chinese potters to expand their skills but their main motive was to gain high profits from it. During the Song period and also prior to it, the tax system concerning the ceramic industry was lenient. Yuan rulers introduced a new system for grading taxes according to which the potters had to register their kilns as per the capacity and the number of craftsmen efficiency (Medley 1975: 8). But despite all the heavy rules, regulations and payments by the Yuan governments, the ceramic industry continued to maintain large revenues as the demand of Chinese porcelain was huge in the overseas markets.

The *Ching-té Chên* (Jingdezhen) kiln in Jiangxi was officially declared as the headquarters of porcelain industry during the Yuan period and about 300 private kilns were associated with it (Li 1996: 142). The entire ceramic industry was maintained and governed by the Yuan rulers. Other regional kilns were Jun, Cizhou, Huo, Longquan, and Dehua. Amongst these kilns, the large sized dishes manufactured in Longquan were especially liked amongst the near and middle east markets (Li 1996: 143).

A number of porcelain varieties were produced at Jingdezhen during Yuan period which includes ch‘ing-pai, shu-fu, blue-and-white, red-and-white, and brown-and-white (Valenstein 1975: 103). Among all the varieties of blue-and-white porcelains were most popular. It had delicately designed motifs of different styles painted in blue on white porcelain base. The cobalt blue colour for decoration and glazes was used in China as early as T’ang period. But the prolific use of cobalt blue
on porcelain was started during the Yuan period as this colour was regarded auspicious among Islamic population (Carswell 2005: 159). The tradition of painting with cobalt blue on earthenware became popular in the Near East particularly in Persia during the 13th century CE. The results were not satisfying as cobalt used on earthenware had a tendency to run down. The decoration with cobalt thus tried on a high-fired pottery like Chinese porcelain which gave the required results (Medley 1976: 176-177).

Besides the new porcelain varieties some old varieties such as celadon ware in olive green colour and Yaozhou style of celadon was continued to be manufactured along with wares with brown, dark flambé, and bluish-white glazes (Li 1996: 142-143). More new decorative features were added which were inspired by the nature and everyday life i.e. animals, flowers, religious motifs, etc. The Yuan’s period was short but impressively fruitful in terms of the history of trade and export of Chinese porcelain.

**Ming Dynasty (1368-1644 CE)**

The Ming period was rich in terms of porcelain development. The styles and patterns used in Yuan porcelain became more refined and new ornamental techniques were applied on Ming porcelain (Valenstein 1975: 127).

Although the Ming period achieved new heights in porcelain production but the initial years of Ming dynasty were a little difficult. The concept of overseas trade which was popular during the Yuan dynasty came to a halt when Ming dynasty overthrew the rule of Yuan from China in 1368 CE. This drastic change of dynasties in China greatly affected its well-established overseas trade relations with foreign countries. Initially the Ming emperors of China forbade foreign travel and prohibited merchant ships from sailing beyond coastal waters (Li 1996: 207).

The first ruler of Ming dynasty, Chu Yuan-chang (Hung-wu) (1368-1398 CE) restricted trade activities with the outside world (Vainker 1991: 140). He changed the free trade policies of China and banned all the overseas activities. Both financially and culturally, it created a huge loss and many official kiln sites at Jingdezhen and Longquan which
produced huge quantities of blue-and-white porcelain and celadon wares were shut-down for some years (Krahl 1986: 484-485). The production of the porcelain declined and its export was stopped. Porcelains were only prepared for the domestic markets.

During the initial years of Ming period, the blue-and-white porcelain variety was treated “very vulgar” and was ignored by the Chinese (Medley 1973: 91). The emperor, Hung-wu, admired red (hong) colour and he preferred use of red colour in artefacts including red-and-white porcelain (Li 1996: 209). In terms of decoration and style, the red-and-white porcelains were painted with floral designs. The embellishment of the flowers of four seasons, peony for spring, pomegranate for summer, chrysanthemum for autumn and camellia for winter, became a special subject of decoration for the Chinese potters (Vainker 1991: 140).

The reign of Hung-wu ended in 1398 CE followed by the rule of Chien-wen (1399-1402 CE). The period of Chien-wen was short-lived and soon Hung-wu’s son Yung lo came to rule in 1403 CE. A new era of Ming dynasty began under the rule of Yung lo (1403-1424 CE), who favoured overseas trade activities and interactions with the outer world and export of the Chinese porcelain. The kiln sites developed and kilns of Jingdezhen reached at an advanced stage.

The gourd-shaped kiln which originated during the Song period became famous during the Ming period. The remains of this type datable to early or mid Ming period are traced in Wu-ni-ling at Jingdezhen. Measurements suggested that this kiln was 8.4 m long, had two chambers amongst which first one was about 3.7 m wide and the second was 1.8 metres (Kerr and Wood 2004: 366). This type showed an amalgamation of other kiln types - dragon, stepped and man-thou kilns.

The remains of stepped kilns datable to Ming dynasty are found in Fukien, Kuangtung and Chiangsi provinces of southern China (Kerr and Wood 2004: 364). The type was although not been used in the Jingdezhen as other kiln types, dragon, mantou and gourd-shaped were more popular.
During the late Ming period, a new type of kiln namely *zhényào* or egg-shaped kiln developed in Jingdezhen. This type became so popular and efficient that it continued to be used till date though only for reproducing certain wares (Kerr and Wood 2004: 368). It resembles the shape of an egg thus named so. Its chimney was tapering and as tall as the kiln itself (Wood 2007: 67). The kiln had only one firebox at the larger end. The saggars containing porcelain pieces were placed in lines leaving very small gaps. As the heat was high in the front, medium in the middle and moderate in the back so the wares were kept accordingly. Sometimes empty saggars were kept in the front or filled with coarse and rough wares. According to ancient Chinese texts *Chiangsi Sheng Ta Chih* (Great Gazetteer of Chiangsi Province, 1597 CE); *Thien Kung Khai Wu* (The Exploitation of the Works of Nature, 1637 CE); *Thao Shuo* (Description of Ceramics, 1774 CE) and *Ching-te-chen Thao Lu* (An Account of Ceramic Production at Ching-te-chen, 1815 CE), the kilns were first slow fired for 7 days and nights and then intense firing was done for 2 days (Kerr and Wood 2004: 372).

The blue-and-white porcelain variety was immensely manufactured at the Jingdezhen most of which was exported to overseas countries. During the Yung-lo reign, three types of porcelains were made i.e. monochrome white; blue-and-white; and enamelled porcelain (Bushell 1910: 56-57). The monochrome white porcelains were similar in shapes as blue-and-white porcelain. The Yung-lo porcelain was thick in composition and the designs on white porcelains were made by the way of incising which were also copied from the blue-and-white porcelain variety and a few pieces were also marked with *nien-hao* mark (Valenstein 1975: 130). During this period, the kiln sites of both northern and southern China progressed and porcelain in large quantities were produced. The northern kiln sites of Jun, Ding, Cizhou and southern kilns like Longquan, Dehua and Yixing produced porcelains for the domestic as well as foreign markets. The kilns of Jingdezhen reached at its peak as advanced technologies were adopted at this site for producing celadon and porcelains (Li 1996: 208).

Yung-lo enhanced trade interactions and for increasing official contacts, he sent envoys in other countries. He sent expeditions to Southeast Asia, India and Syria, under the command of Cheng Ho (Zheng He). During Yung-lo’s reign, Zheng He undertook six voyages in 1405, 1407, 1409, 1413, 1417, and 1421 exclusively for the
commercial benefits of China (Mote and Twitchett 1998: 232). In all his six voyages, Zheng He after crossing through Southeast Asia and Sri Lanka reached at the Malabar Coast and traded a variety of goods (Mills 1970: 27-32). A large number of precious items including silk and porcelain were presented to the kings in the form of tributes on behalf of Ming emperor.

After the end of Yung-lo reign, emperor Hung-hsi ruled over China for a year in 1425 CE. The next famous ruler of Ming dynasty was Hsuan-te (1426-1435 CE). He was the first emperor under whom the tradition of painting or inscribing reign marks *nien-hao* on porcelain became popular (Valenstein 1976: 129). Porcelain varieties blue-and-white, red-and-white, over-glaze enamels, monochromes, etc. were continued to be manufactured under Hsuan-te’s reign. But the blue-and-white porcelain became especially popular among elites and royals (Finlay 2010: 164). This variety became so prized that potters in later centuries illegally inscribed the Hsuan-te emperor’s reign mark on their wares in order to increase its value in the market (Krahl 1985: 41-57; Bushell 1910: 142).

After Hsuan-te reign were Cheng-t’ung (1436-1449 CE), Ching-t’ai (1450-1457 CE) and T’ien-shun (1458-1464 CE) which are referred collectively as a period of “Ceramic Interregnum” (Valenstein 1975: 138). It is believed that this period of 27 years showed a halt in the progress of porcelain production by the orders of the government and modifications in kilns (Medley 1976: 201). The porcelains of this period were inconsistent in quality and heavily constructed. The porcelain pieces were found having unusual shapes and stepped base (recessed base in two or three stages) (Medley 1963: 83-96). It is believed that the porcelain pieces of this period were not inscribed with dynastic marks.

After the period of interregnum, the rule of emperor Ch’eng Hua (1465-1487 CE) came. Porcelain of this period reflected royalty of emperors. The designs on the porcelain were outlined before the application of irregular colours (Valenstein 1975: 139). The blue-and-white variety dominated during this period also and the soft greyish blue replaced the ‘heap and piled’ effect of Hsuan-te blue-and-white (Bushell 1910: 60; Medley 1976: 203). The green-and-white variety of porcelain having incised
and enamelled design was an innovation of Ch’eng Hua reign. Other varieties included porcelain with coloured glazes and porcellaneous stonewares.

Next emperor was of Hung-chih reign (1488-1505 CE). Porcelains manufactured during this reign were of fine quality. Different types of polychrome enamels were produced during this period. The techniques used were combination of under-glaze and over-glaze (Valenstein 1975: 146).

The Cheng-te reign (1506-1521 CE) was regarded as the last great epoch of development and achievements. The middle-eastern countries started imitating porcelain with the beginning of 16th century CE and China on the other hand started producing blue-and-white porcelain in Islamic shapes along with decoration of Arabic calligraphy (Vainker 1991: 142). The cobalt of this period had watery tendency and a greyish tint (Valenstein 1975: 147). The cobalt used during this period was of two different varieties i.e. Muhammadan blue, an imported cobalt and shih-ch’ing or stone blue, native cobalt (Medley 1976: 217). Other varieties of porcelain were of over-glaze polychrome wares in red-and-green and coloured glazes having combinations like green-and-yellow.

In the reign of emperor Chia-Ching (1522-1566 CE), production of porcelain increased but the quality declined (Valenstein 1975: 150). The blue-and-white porcelain continued to be manufactured during this period along with polychromes and monochrome wares. The blue used on porcelain had a different purplish tone.

The next two reigns, Lung-Ch’ing (1567-1572 CE) and Wan-li (1573-1620 CE) showed a quick decline in porcelain manufacturing. The style of Lung-Ch’ing porcelains was similar to the Chia-Ching porcelains but the Wan-li period showed a new variety of Kraakporselein along with other regular porcelains such as under-glaze blue with red enamel and polychrome wares (Valenstein 1975: 161, 164). Kraakporselein, a Dutch form was named after the Portuguese carracks which mean merchant ships (Medley 1976: 225). Extremely popular in Europe, Kraakporselein was thin and light in quality.
and had a bracketed rim (Vainker 1991: 147). Another popular ware that was made for the Southeast Asian markets was Swatow ware, a variety of enameled ware. The ware name derived from the port of Zhantou in the northern Guangdong province of China (Vainker 1991: 145).

After the collapse of Wan-li reign in 1620 CE, the Chinese economy declined and the funds for the porcelain industry were diverted towards military expenses (Vainker 1991: 145). The Japanese and European buyers demanded shapes and decorations which were un-known to Chinese potters that gave birth to the transitional style porcelain. This style of porcelain was thicker and heavier and completely different from the *Kraakporselein* made during Wan-li reign (Medley 1976: 229). The over-glaze enameled ware of this period was showed a link between the *wu-ts'ai* type decoration of the Wan-li and *famille verte* enamels of later K’ang-his’s rule (Valenstein 1975: 168). The two varieties specifically manufactured for Japanese market were Ko-sometsuke which means “old blue-and-white” and Shonzui, another form of blue-and-white (Medley 1976: 236, 238).

**Ch’ing Dynasty (1644-1912 CE)**

China in 1644 CE was captured by Manchus of Manchuria who called themselves as Ch’ing. The porcelains varieties of this period include K’ang-his, blue-and-white, red-and-white, blue-and-red and celadon, *famille verte* enamels, *famille rose*, etc. Among all these, *famille verte* porcelain decorated in translucent enamels with green as a predominant colour and *famille rose*, opaque rose coloured enamel were two most popular wares (Jacquemart 1862: 67-68, 77; Medley 1976: 245). The majority of best wares of the Ch’ing period between 1683 to 1750 CE were manufactured in the kilns of Jingdezhen (Valenstein 1975: 177).

This chapter has emphasized on the technical and scientific study of Chinese porcelain in general. It has discussed the types of porcelain and its manufacturing technique. The manufacturing of porcelain is a long process which required great time and effort. For obtaining excellent results, the ancient Chinese potters have experimented in different
There is another debate regarding the origin of blue-and-white porcelain in China. Findings of blue-and-white porcelain from the level of T'ang period have although cleared many doubts. But it is strange that after the T’ang period, the blue-and-white porcelain was found in the developed form during the Yuan period. Further excavations in China may help in answering that why blue-and-white porcelain did not continue to be manufactured during the five dynasties and Song period and how it suddenly emerged as an extremely refined ware during the Yuan period.