The thesis describes the banded iron quartzites and the associated iron ores exposed in Nagavi-Doni area. These along with the associated greenschists, shales and argillites belong to Precambrian age and form the central portion of the famous auriferous Gadag schist belt. A rectangular and radial drainage pattern is noticed in the area under study. The banded iron quartzites constitute the cores of the ridge like hills, their trends being controlled by the strike, while their bends are correlated to refolding of the banded iron quartzites. The strike of the banded iron quartzites varies considerably from Nagavi in the west to Kadampur in the east, namely N60°W-S60°E through E-W upto N40°W-S40°E, respectively. This acute change in the strike is interpreted as a syntaxial bend in the rocks. The banded iron quartzites display inclined isoclinal folding with a characteristic Dharwarian easterly dip for the limbs of the fold.

The banded iron quartzites are regarded as the products of low grade metamorphism of rhythmically banded ferruginous siliceous sediments, the latter being deposited in the shallow water basin under strongly oxidising environment. The source rocks from which large quantities of iron and silica were derived were just common rocks as are found in the present day crust of the earth. However, those rocks were subjected to unusual weathering which appears to have prevailed during the Precambrian times alone. The banded iron quartzites belong to the oxide facies of James (1954) because these consist dominantly of hematite and quartz, followed by small amount of magnetite and calcite while, carbonate, sulphide, and silicate facies are totally lacking in them. Martitization of magnetite leading to hematite is a common feature. The average chemical composition of the banded iron quartzites in weight percentage is Silica 55.89, Ferric iron 36.62, Alumina 2.23, Ferrous iron 0.94, Calcium oxide 0.51, Magnesium oxide 1.05, Sodium oxide 0.58, Potassium oxide 0.16, and Manganese oxide 0.04., and are found to be richest in the content of silica as compared to that found in similar rocks from Atlantic City area, S.Africa, S.America and U.S.A; Extreme poverty of FeO, CaO and MgO in the banded iron quartzites under study,
is a striking feature. The trace elements of these banded iron quartzites in the order of abundance are Zn, As, Ti, Ni, Cu, Pb, Cr, V and least is Ga and these elements are similar to those reported from itabirites of Minas, Gerais, Brazil. The diagrams of Lepp and Goldich and that of Govett clearly support a Precambrian age for the banded iron quartzites under study.

Iron ores are derived from the banded iron quartzites by the processes of leaching away of silica and of residual concentration of iron. Unlike the rhythmically changing (the unusual Precambrian atmosphere) environment envisaged at the time of formation of banded iron quartzites, during the derivation of iron ores from them however, it remained unchanged and favoured leaching away of silica from the original banded iron quartzites. The iron ore deposit near Doni is the sole deposit in the entire Gadag schist belt. This ore body forms the highest place of elevation in the entire Gadag schist belt and is located in "inclined isoclinally folded" banded iron quartzites, plunging due northwest.

The varieties of iron ores in the order of abundance are: massive hematite, laminated hematite, lateritic, limonitic, blue dust and specularite. Massive and laminated ores are primary while others are secondary. The ore minerals in the order of abundance are hematite, martite, magnetite and goethite, while typically carbonates and sulphides are absent. Martitization along (100) crystallographic planes of magnetite grains leading to hematite has occurred extensively. The average chemical composition in weight percentage is Ferric iron 91.06, Alumina 2.97, Ferrous iron 0.81, Silica 2.16, Sulphur 0.09 which indicates dominance of ferric iron followed by alumina, ferrous iron and silica. The relative mobility of elements with depth is as follows: Silica highly mobile, ferric iron immobile, ferrous iron and alumina moderately immobile. The trace elements in the order
of abundance are Ti, Zn, Ni, Pb, V, Cr, Cu, and Ga which are strikingly different from those reported from the iron ores of Sandur schist belt by Shivkumar (1976). Paucity of FeO and constancy of alumina and similarity of trace elements in the iron ores and in the banded iron quartzites clearly suggest derivation of iron ores from the banded iron quartzites.

Absence of quartz veins and basic dikes in the iron ores but their presence in the greenschists and in the banded iron quartzites of Precambrian age indicates the derivation of the iron ores to have occurred during the later phases of the Precambrian or possibly even during the subsequent geological periods. The geological set up and the mode of derivation of iron ores under study is remarkably identical with that described by MacLeod (1970) for the iron ores of Hamersley area, Western Australia, and that described by Dorr II (1952) for the origin of the iron ores of Brazil.