Chapter 1 to 5, give detailed geoscientific information about the stratigraphic, lithologic, structural, petrographic geochemical, & mineralogical data on the area of study. Based on this, a detailed integrated analyses on the genesis and environment of deposition of Raipur limestone of Raipur group, around Nandini, Durg district (M.P.) is interpreted.

6.1. INTRODUCTION

As described in Chapter 1, the area under study constitutes a part in crescent shaped Chhattisgarh Basin. Though the studies go back to as late as Bedlicott (1866), Blanford (1869-70), Bose (1998-99), Bhattacharjee (1936-38), however, detailed studies were not carried out except by Dutt (1964), Schnitzer (1969, 1971), Murti (1970, 1972, 1978a & b, 1981, 1987) and Wadhwa (1976). From these previous studies it was felt that a detailed study on the genesis and environment of deposition of Raipur limestone was necessary, and so the present investigations were carried out.
6.2 STRATIGRAPHY

As described in Chapter 2, representative samples were collected from the different lithological units. Based on field studies, the major lithounits identified are: purple gray stromatolitic limestone; purple gray dolomitized limestone and purple calcareous dolomitic shales. In purple gray stromatolitic limestone, few cm. thick bedded massive and pelletic limestones were observed. Dolomitized limestone is fine to coarse grained showing circular or elliptical rings on the weathered surface. Calcareous dolomitic shale contains pelletic limestones and intraformational conglomerate. Based upon the stratigraphic & lithofacies studies the area has been divided into three broad Lithofacies: Lithofacies A, (purple gray stromatolitic limestone); Lithofacies B, (dolomitic limestone) and Lithofacies C, (purple calcareous dolomitic shales).

6.3 PETROGRAPHY

Based on thin section studies, the major petrographic constituents recognized are: micrite; sparry calcite cement; pseudospar; replacement dolomite etc.
Several environmentally significant microfacies have also been recognised: stromatolitic micrite; massive micrite; bedded micrite; dolomitized micrite; pelmicrite; flat pebble conglomerate etc.

The genesis and environment of deposition of Raipur limestone was also attempted. Based upon the criteria stromatolitic micrite of Lithofacies A, suggests tidal flat low energy environment of deposition. At a few places presence of pelmicrite may represent tidal channel fills. Stromatolitic limestones of this Lithofacies belong to low energy intertidal environment. However, the presence of mud cracks in this sequence are suggestive of upper parts of intertidal to supratidal environment.

Dolomitized micrite occurs in Lithofacies B. Petrographic studies on dolomite suggests that dolomitization is of secondary origin and it resulted by early to late diagenetic changes. Dolomite bodies have been deposited in shallow near shore uneven basin which may be divided into number of sub basins. Higher values of pH, Pco$_2$, CO$_3$ ion concentration prevailing in these closed basins gave rise to
early replacement. Evaporation of sea water increases the Mg/Ca ratio, in intertidal water to a value that permits replacement of calcium carbonate by dolomite.

Purple calcareous and dolomitic shale occurs in Lithofacies C. Absence of algal stromatolites suggest that the deposition was on supratidal flats, which is not amenable for the growth of stromatolite. Lenses of pelmicrite and flat pebble conglomerate occurring in this lithofacies can be interpreted as deposits of supratidal flats. Pelmicrite and flat pebble conglomerate along with desiccation cracks indicate that the pellet mud was subaerially exposed, hardened and broken due to desiccation.

6.4 GEOCHEMISTRY AND MINERALOGY

Chemical analysis (major, & trace) of representative samples of all the Lithofacies was carried out to determine the extent of dolomitization and to also understand the inter elemental relationship which will indicate the depositional environments.
Based upon the classification of Chillingar (1957) and Frolova (1959), Raipur limestone can be regarded as slightly dolomitic limestone to dolomitic limestone, with sparse dolomitization restricted to Lithofacies B.

The average value of Mn (313 ppm), Sr (120 ppm), Na (4400 ppm), K (4286 ppm), Pb (11.6 ppm), Zn (77.56 ppm), Cu (64 ppm), Ni (59.3 ppm) and Co (26.8 ppm) are suggestive of shallow marine nature of these rocks.

Trace elements (Pb, Zn, Cu, Co) associated with the organosedimentary algal activity have higher values in Lithofacies A, as the rocks are stromatolitic. Sudden drop of these values in Lithofacies B might have resulted due to diagenesis.

Mineralogy based on XRD, shows that Raipur limestone can be regarded as predominantly calcitic (Lithofacies A) with dolomitization confined to Lithofacies B. The limestones have significant silica in the form of quartz.
6.5 SEDIMENTARY STRUCTURE

The sedimentary structures present in the study area are: bedding; desiccation cracks; stromatolites; karstic features; stylolites; veinlets etc. Desiccation cracks and mud pebbles in Lithofacies C are indicative of upper tidal to supratidal zone.

The stromatolitic assemblage of Raipur limestone comprises of Colonnella columnaris, Nucleella, Baicalia baicalica, which indicate marine intertidal environment. The above stromatolitic assemblage is suggestive of Middle Riphean age.