ABSTRACT

The thesis embodies the results of detailed investigation made on the study of the magnesite mineralization of the area around Jhiroli (Lat. 29°37'30'; Long. 79°40'4") in Almora district of Uttar Pradesh which is a part of Calc Zone of Deoban - Tejam belt (Gansser, 1964).

The rock types present are quartzites, phyllites, cherty limestones, stromatolitic limestone and dolostone containing crystalline magnesites. Both nondiastrophic and diastrophic structures have been recognized. Structural analysis on macroscopic mesoscopic and microscopic scales reveals that the area has undergone at least two generations of major deformation. The first generation has resulted tight isoclinal fold (F_1) on bedding (S_1) with the development of axial plane schistosity (S_2). During the second generation, open to close folding (F_2) with synforms and antiforms has been developed. During this stage, initial schistosity (S_2) has been puckered and crenulation cleavage (S_3) has been formed. This is followed by the development of kink bands (S_4) and conjugate folds which may be related to F_3 fold of restricted nature. Different types of lineation, joints, faults and thrusts have been recorded and an attempt has been made to find out the relationship of these structures with magnesite mineralization. The detailed petrographic study shows that the area has been subjected to medium grade of metamorphism which is mainly syn-to post-kinematic with reference to F_1 fold.

The reconstruction of the environment of the deposition has been attempted from the lithofacies relation and the study of stromatolites. Five distinct types of lithofacies have been recognized and the local stratigraphy has been established. The tidal flat depositional environment of the sediments has been suggested mainly on the basis of sedimentological study. The study of miospores recovered from the stromatolitic

limestone suggests Permo-Trias age for the sediment which is further corroborated by the thermoluminescence age dating.

The mineralization is mainly controlled by stratigraphy, lithology and structures. On the basis of field and laboratory studies, the replacement origin of magnesite has been assigned. It is suggested that the magnesium rich solution has been originated by the dedolomitization of dolostone due to dynamic metamorphism, which later, reacted with the dolomite grains giving rise to volume for volume replacement of dolomite by magnesite. The mineralization is in general syn- to late-kinematic with reference to F_2 fold.

The mineralogy of the magnesite and other associated carbonates and silicates both in raw and calcined forms has been determined with the help of X-ray diffraction pattern, DTA and Infrared spectroscopic studies. Calcite, dolomite and talc are the common associated minerals. In addition to these, the presence of huntite and vaterite has also been ascertained. Breunnerite is also present. The study of different size fractions of magnesite indicates that talc gets concentrated in finer fraction whereas calcite and dolomite are concentrated in intermediate fractions. Calcite and dolomite remain undecomposed till 780°C. At 1200°C both calcite and dolomite are totally decomposed and periclase and forsterite appear at the expense of magnesite and talc respectively. The above data will be helpful to obtain low calcium or low silica magnesites.

A computer based correlation coefficient study of the three variables namely MgO, CaO and SiO_2 from the available bore hole data has been carried out. The study shows that MgO and CaO have a positive correlation. Lack of correlation between MgO and SiO_2, indicates a widespread silicification of the magnesite body. The above study will help in grade prediction and for further exploration and exploitation of the magnesite deposits of the area.

In order to find out the suitability of the Jhiroli magnesite for the extraction of chemical grade magnesia,

attempts have been made to precipitate out economically, the undesirable constituents like R_2O_3 (mainly Fe_2O_3) and CaO. Optimum time, temperature, grain size and dilution have been determined. A suitable flow sheet has been developed.