



X-RAY DIFFRACTION STUDIES OF CARBONATE ROCKS AROUND WESTERN PART OF PALNAD SUB BASIN, GUNTUR DISTRICT, ANDHRA PRADESH

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Abstract: *The diffractogram analysis of the Kurnool carbonates showed $3.34A^\circ$, $3.04A^\circ$ and $2.84A^\circ$ strongest lines representing calcite mineral, $4.24A^\circ$, $3.35A^\circ$, and $2.45A^\circ$ strongest lines representing quartz mineral and $3.60A^\circ$ strongest line representing mineral dolomite. The calcite peaks were strong and prominent and well resolved, some of them showed secondary peaks indicating that they are magnesian calcite with stoichiometric proportions of magnesium and calcium. The peaks represented by the mineral dolomite is very mild and small. Thus the X-ray diffractogram analysis revealed that the carbonate rocks of Kurnool Group contain calcite, dolomite and quartz as dominant mineral composition.*

Key words: *Diffractogram, Dolomite, Calcite and Quartz.*

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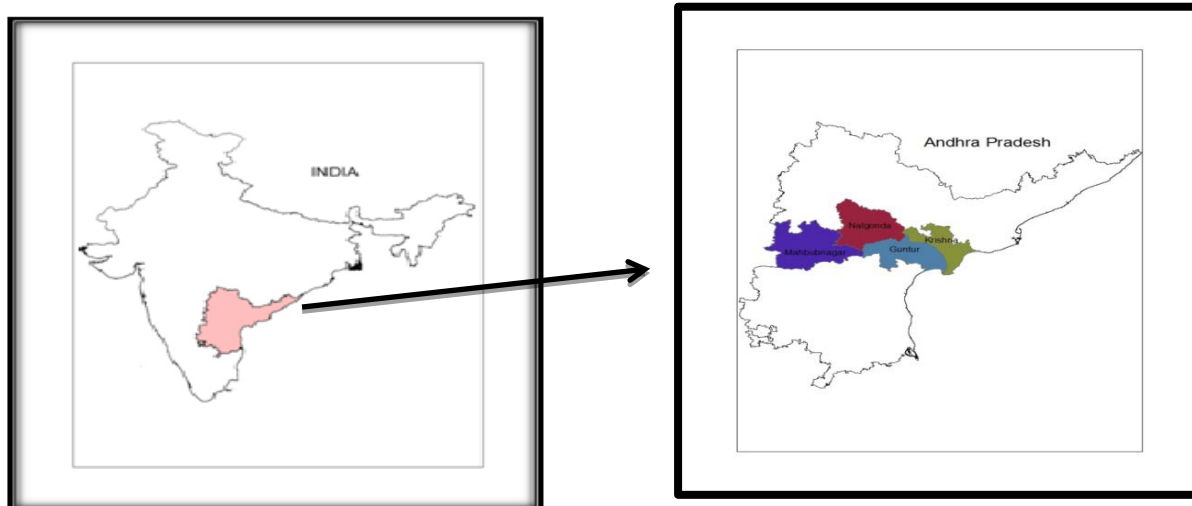
INTRODUCTION

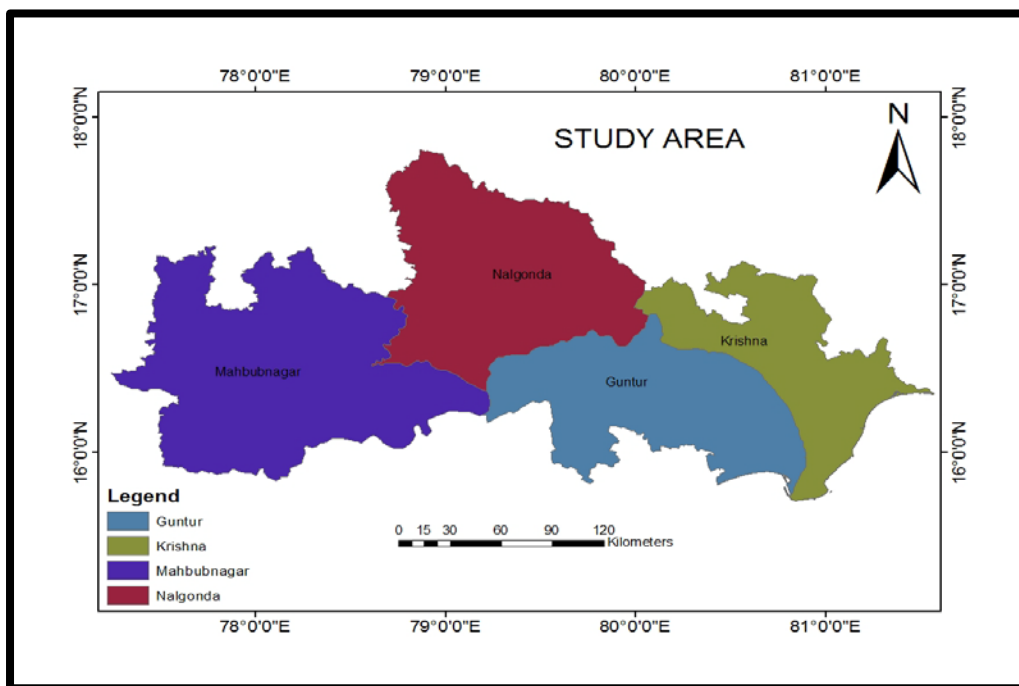
The Late Proterozoic Kurnool Group of rocks are exposed in Kurnool as well as in Palnad sub-basin. The Palnad sub-basin forms NE part of Crescent shaped Cuddapah basin, covering an area of about 3600 sq.Kms in the Krishna valley. The Palnad basin are developed mainly as half graben due to reactivation of related fractures (Nagaraja Rao et.al,1987) and rocks belonging to Kurnool group are exposed in two basins; one is Kundair basin and the other in Palnad basin. Principally mineralogical and textural features of these rocks have been examined and a brief account is given of the characteristics of the rocks in the study area. The chief lithological units in the Kurnool Group are conglomerates, quartzite, shale and limestone.

LOCATION OF THE STUDY AREA

The Kurnool Group of rocks are well exposed in Kurnool, Cuddapah, Guntur, Krishna, Nalgonda and Mahabubnagar districts of Andhra Pradesh. The exposures can be noticed in two basins, one in the Kurnool basin and the other in the Palnad basin. The Kurnool basin, extends between the latitude $14^{\circ}30'$ - $16^{\circ}00'$ and longitude $77^{\circ}58'$ - $78^{\circ}45'$, covering an area of about 14,500 sq Kms The Palnad basin which is found in the North-Eastern part of Cuddapah basin extends between the latitude $16^{\circ}18'$ - $16^{\circ}55'$ and longitude $79^{\circ}18'$ - $80^{\circ}26'$ covering an area of about 3600 sq. Kms (Survey of India toposheets : 56 P/6, 7, 8, 10, 11 and 65D/1 and 2). The location map of the area is shown below.

Fig 1: Location of the study area





The area is accessible from Hyderabad, Guntur and Vijayawada. Two major towns in the area, Macherla in Guntur district and Jaggayyapeta in Krishna district are very well connected by rail and road network.

GEOLOGY

The rock types constituting the Kurnool Group of rocks in Palnad basin are mainly of quartzites, shales and limestones. The generalized geological succession or stratigraphy of the area was first given by king (1872).

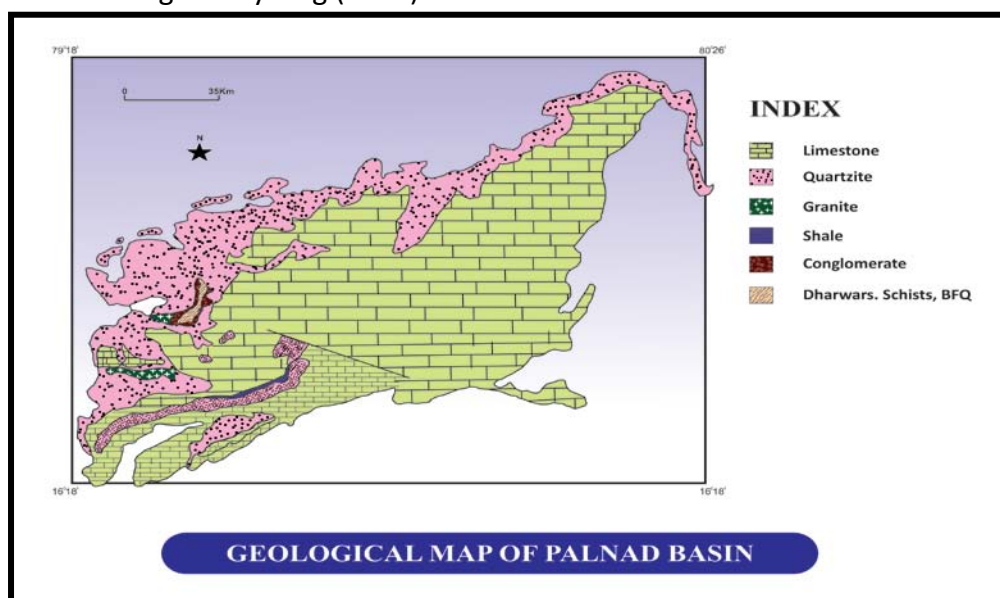


Fig 2: Geological map of Palnad basin



The Kurnool strata crop out in two isolated areas, namely in Kurnool basin and the other in the Palnad basin. The lowermost formation of the Kurnool is the Banaganapalle conglomerate, Sandstone and quartzite. The conglomerate being occasionally diamondiferous. It is succeeded by the Narji massive or flaggy limestone with shale and quartzite intercalations. This is well developed in both the basins, where huge reserves of limestone suitable for the manufacture of cement exist. The Narji is succeeded by the Owk Shale. The Owk shale is overlain by the Paniam quartzite, which in turn is overlain by earthy siliceous Koilkuntla Limestone, followed by purple calcareous Nandyal Shale with thin intercalations of limestone.

RESULTS AND DISCUSSION

X-ray Diffractogram Study for Carbonates

The carbonates of Kurnool Group are fine grained (micrite to cryptocrystalline) limestones/dolomites. X-ray diffractogram analysis has been carried out and the curves are obtained. The diffractogram analysis was carried out by using Rigaku Miniflex Diffractogram (CN 2005) with Nickel filter and Cu K α radiation. The instrumental parameters of the X-ray diffraction is as follows;

KV = 30, mA = 10, Scanning Range; $2\theta=3-50^\circ$, Speed = $2^\circ/\text{min}$, Chart Drive = 4mm/min, Time Constant = 1 second, Range = 500 cps Final Angle = 50° .

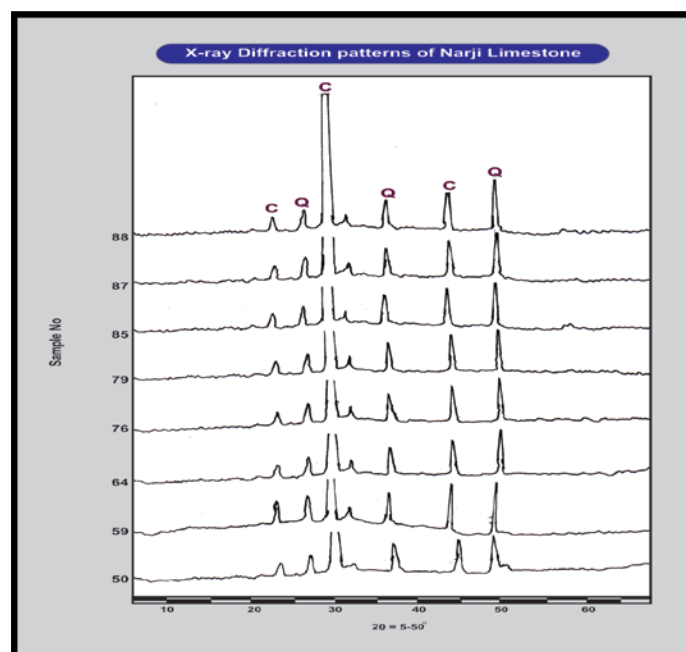


Fig 3: X Ray diffraction pattern of Narji limestone

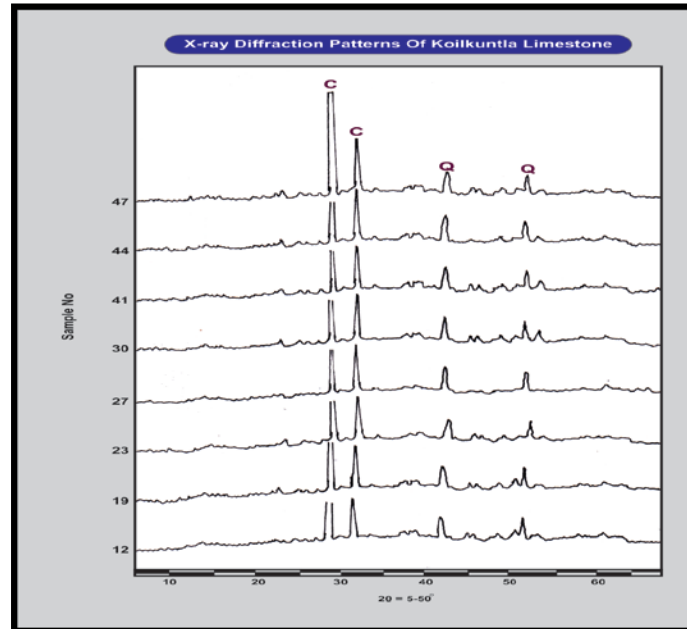


Fig 4: X Ray diffraction pattern of Koilkuntla limestone

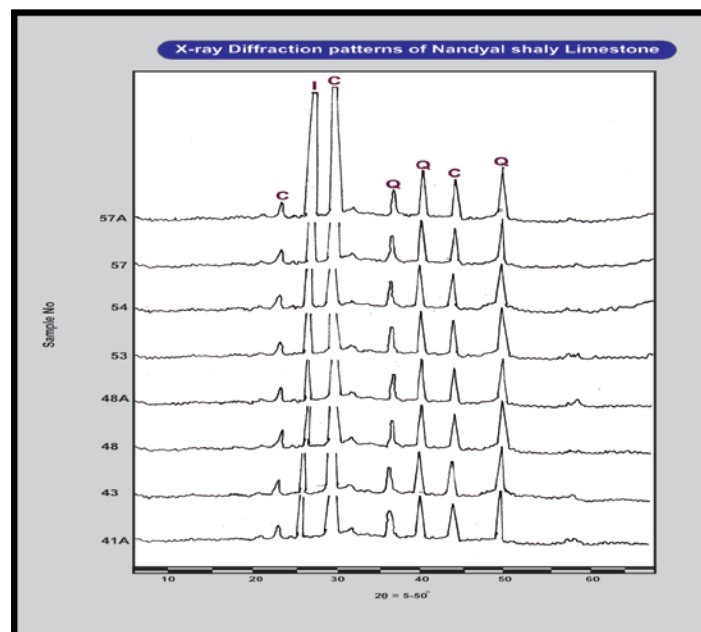


Fig 5: X Ray diffraction pattern of Nandyal shaly limestone

The d values are calculated using Bragg's equation and the intensity was measured in terms of peak heights. The d spacings obtained on the diffractogram are compared with the d spacings of standard minerals on ASTM values. The diffractogram analysis of the Kurnool carbonates showed 3.34\AA , 3.04\AA and 2.84\AA strongest lines representing calcite mineral (Fig 3,4 and



5), 4.24\AA , 3.35\AA and 2.45\AA strongest lines representing quartz mineral and 3.60\AA strongest line representing mineral dolomite. The calcite peaks were strong and prominent and well resolved, some of them showed secondary peaks indicating that they are magnesium calcite with stoichiometric proportions of magnesium and calcium. The peaks represented by the mineral dolomite is very mild and small. Thus the X-ray diffractogram analysis revealed that the carbonate rocks of Kurnool Group contain calcite, dolomite and quartz as dominant mineral composition. Besides, the mineral composition of carbonates has also been confirmed by the chemical analysis of samples.

SUMMARY AND CONCLUSION

The X-ray diffraction study revealed calcite, dolomite, ferroan calcite, ferroan dolomite, dolomite + ferroan calcite, dolomite + ferroan dolomite. Thus from the above studies it is inferred that the carbonates are deposited in a gradually deepening ocean as chemical precipitates. By projecting the measured d values on such a grid, the composition of a specimen can be estimated by the intersection of the related isoparametric lines. The selected reflections are intense, sharp and close to each other, thus facilitating the d measure and reducing the data-collection time.

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