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Note

LATTICE VARIATIONS IN NATURAL MAGNESIUM CALCITES

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This study deals with the results of X-ray diffraction and thermal analyses for natural magnesium calcites in Narji limestones from Cuddapah basin (India). For comparison, pure synthetic calcite (Tem-Press Res. Inc., U.S.A) was also utilized. Earlier work by several authors [1–3] indicated the effect of magnesium substitution on lattice dimensions of calcites. The influence of magnesium in solid-solution on the dissociation of calcite was also reported [4]. The current investigations bring out the changes in d spacings for natural calcites even with small magnesium percentages.

EXPERIMENTAL

Magnesium calcite was separated from natural samples by conventional flotation methods using oleric acid as collector. Chemical analyses were carried out using the published procedures [5]. X-ray diffraction patterns for the samples were obtained on a General Electric unit with an XRD-6 diffractometer and nickel-filtered copper radiation. The differential thermal analyses were carried out on a DuPont 900 differential thermal analyzer fitted with a 1200°C furnace assembly using alumina as reference material.

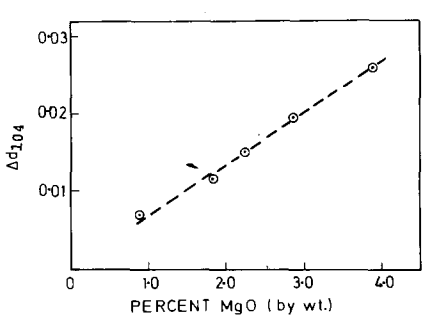

Fig. 1. Variation of d spacing for (104) in calcite with the magnesium content (Δd is the difference between the values for pure synthetic and natural magnesium calcites).

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RESULTS AND DISCUSSION

X-ray diffraction patterns, for the Narji limestones, contain a dominant peak at 3.023 Å (104) with subordinate peaks at 2.481 Å (110), 2.275 Å (113) and 2.015 Å (202) which are characteristic lines for calcite. It was noticed that the d values of calcite from these samples are slightly less in comparison to the Tem-press Research Institute (U.S.A.) sample. The differences, Δd, for the (104) plane between the d values for synthetic pure and natural magnesium calcites were compounded. Chemical analyses were carried out for MgO, MnO and Fe estimation. The results indicated that MnO and Fe are present only as traces. MgO is present at different levels in the samples varying from 0.96 to 3.94%. Figure 1 indicates the variation of Δd for the (104) plane with MgO content.

Differential thermal analysis curves for samples collected from different locations in the basin are given in Fig. 2. The shift in temperature for the

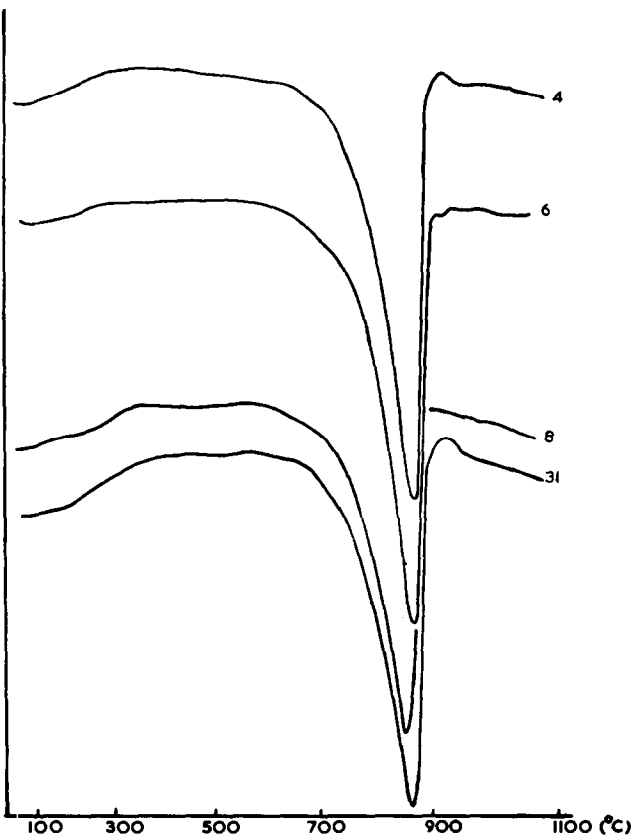

Fig. 2. Differential thermal patterns for Narji limestones (4, 6, 8 and 31 are the sample numbers for different locations in the basin).

endothermic peak of calcite from 920 to 860°C confirmed the presence of magnesium in the calcite lattice. Magnesium substitution in the calcite lattice is possible to varying degrees, in general, dependent upon the temperature and carbon dioxide pressure [6]. The presence of magnesium in calcite lattice in Narji limestones indicates diagnostic changes in the sediments.

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