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## CORRENSITE FROM THE SIRBAN LIMESTONE OF RIASI JAMMU AND KASHMIR STATE, INDIA*

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*Introduction:* The Sirban limestone of Riasi occurs as an inlier in the Muree belt of the outer Himalayas in Jammu and Kashmir State, near the town Riasi (33°41′N : 74°50′E). In aerial plan it is lenticular in shape, and structurally thrown into an asymmetrical anticline (Rao *et al*, 1967). A section measured from the core of this anticline to the base of an Eocene quartzite near Salal to the north of Riasi town presents a stratigraphic thickness of about 1370 m and is divisible into nine units on a lithological basis. The first eight from the base are essentially dolomites, and a flysch like repetition of thin micritic limestone and shale form the ninth unit. The sample containing correnite described in this paper is reported as coming from unit no. 4.

*Petrography:* In hand specimen, the sample yielding corrensite, is a dull bluish grey, earthy rock that crumbles to powder on gentle crushing. Petrographically, it is a microdolosparite and gives the exclusive peak for dolomite (2.884Å) on the X-ray diffractogram. Thin sections of this rock also show a microspar mosaic with individual spars coated with clay minerals of golden yellow colour. Sometimes, the clay mineral aggregates are organized as thin, intercalated, impersistent streaks in the otherwise microspar mosaic. Obviously, the golden yellow clay coatings and streaks contain corrensite.

*X-Ray analysis:* The carbonate rock was leached in dilute acid and insoluble clay residues were separated. A slurry containing the minus two micron size fraction of this material was prepared and sedimented on glass slides to obtain oriented (001) aggregates. Some slides were exposed to ethylene glycol vapors for more than 24 hours. Air dried slides were also heated up to 500°C for half an hour in steps of 100°C. A General Electric XRD-6 X-ray diffractometer operating at 36 KVP and 18 mA with nickel-filtered copper radiation ($CuK\alpha$) was used in this investigation. The goniometer speed was calibrated at 2° $2\theta$ per minute with electronically controlled strip-chart recorder. X-ray data for the Riasi sample are presented in Table I; Fig. 1 shows diffractograms of air dried, glycolated and heat treated oriented aggregates of the same material. It is evident from both the table and illustration that air dried aggregates of clay from the Riasi material show a fundamental periodicity

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of 30.9Å interlayer spacing which expands to 31.5Å on glycol saturation. The periodicities are, however, destroyed except the 13.7Å peak on heating the material at 500°C for half an hour. These characteristics, nevertheless, demonstrate that the clay material associated with the Riasi limestone contains corrensite i.e. a regularly interstratified 1 : 1 mixed-layered vermiculite-chlorite.

*Comparison:* Table I shows a comparison of the Riasi material with those of Röt member of West Germany (Lippman, 1956) and Brazer limestone of Colorado in U.S.A. (Bradley and Weaver, 1956). Of the three, the corrensite of the Brazer limestone possesses a higher crystal ordering and exhibits fundamental periodicities at 29Å, 31Å, and 24Å for air-dried, glycolated and heat treated aggregates respectively. The periodicity of the air dried Riasi corrensite is comparable with the air dried interlayered clays of Brazer limestone; the corrensite of the Riasi material,

TABLE I

Comparative x-ray data in Angstrom Units (A.U.) of corrensites from West Germany (Lippman, 1956), U.S.A. (Bradley and Weaver, 1956) and India (Rao and Bhattacharya, 1972)

| Basal spacings | Lippman (1956) | | | Bradley and Weaver (1956) | | | Rao and Bhattacharya (1972) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Un-treated | Ethylene glyco-lated | Heated 550°C | Un-treated | Ethylene glyco-lated | Heated 550°C | Un-treated | Ethylene glyco-lated | Heated 500°C |
| 001 | 29.0 | 31.0 | 24.0 | 29.0 | 31.0 | 24.0 | 30.9 | 31.5 | — |
| 002 | 14.5 | 15.5 | 12.0 | 14.6 | 15.5 | 12.0 | 14.9 | 15.2 | 13.7 |
| 003 | — | — | — | 9.7 | 10.2 | 8.0 | 9.7 | — | — |
| 004 | 7.2 | 7.8 | — | 7.3 | 7.7 | 6.0 | 7.2 | 7.2 | — |
| 005 | — | — | — | 5.9 | 6.2 | 4,8 | 5.3 | 5.9 | — |
| 006 | 4.8 | 5.2 | — | 4.9 | 5.1 | 4.0 | 4.8 | 4.8 | — |
| 007 | — | — | — | 4.2 | 4.4 | 3.4 | 4.2 | — | — |
| 008 | 3.6 | — | — | 3.6 | 3.8 | 3.0 | 3.6 | 3.5 | — |
| 009 | — | — | — | 3.3 | 3.4 | — | 3.2 | — | — |

however, shows divergence from the corrensite (or better regularly interstratified chlorite-vermiculite) of Brazer limestone in the periodicity of the glycolated and heat treated aggregates. The (003) and (007) odd reflections in glycolated Riasi corrensite are weaker and so have not appeared on the diffractometer trace. Moreover, most of the integral peaks are destroyed on heating to 500°C except the peak with a spacing of 13.7Å. This is presumably due to the poor crystallinity of the Riasi corrensite and variability in the composition of vermiculite in mixed-layering (Warshaw and Roy, 1961). Fig. 1 also exhibits a gradual decrease in the intensity of (001) peak of the Riasi corrensite as the material is heated and eventually the peak is completely lost by breakdown of its structure at 500°C.

The Triassic Röt member corrensite (air dried) shows fundamental periodicity of 29Å interlayer spacing, but even here some odd reflections are poor or missing. Glycolation shows 31Å fundamental periodicity but again exhibits the absence of some odd reflections. The reflections of the heated sample, according to Lippman (1956), are poor but he argues that fundamental periodicity of the 24Å interlayer spacing is retained after heating to 550°C. The peculiar behaviour of the corrensite of the Röt member is due to poor crystallinity of the material (Lippman, 1956) and considerable interference from the presence of other clay minerals especially illite. In comparison to the corrensite of the Röt member, the corrensite present in the Riasi material is pure, least admixed with other clay minerals or quartz, and presumably has a better structural organization. In all possiblity it is diagenetic in origin.

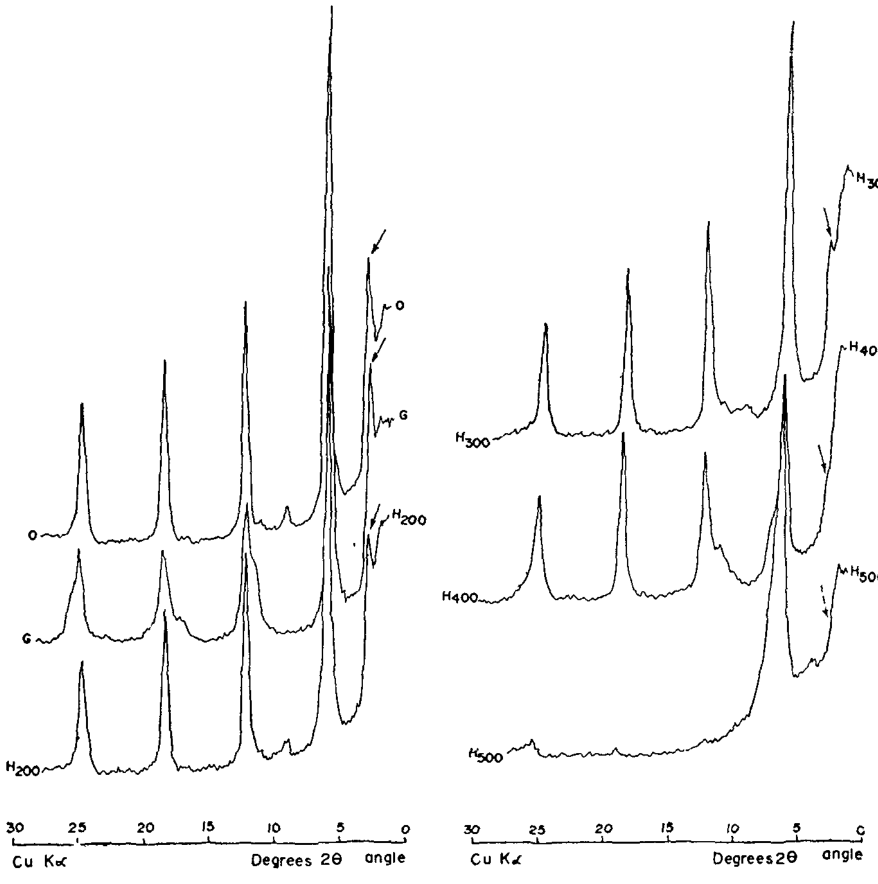


Figure 1. X-ray diffractometer traces of the insoluble clay residue ( - 2μ size) from Sirban limestones in Jammu and Kashmir state showing presence of corrensite. (O) sample air-dried, (G) sample treated with ethylene glycol, ($H_{200}$, $H_{300}$, $H_{400}$ and $H_{500}$) sample heated separately to 200°C, 300°C, 400°C and 500°C respectively. Arrow marks indicate gradual destruction of the structural network by heating.

*Conclusion:* Considerable difference of opinion exists on the nomenclature and structural configuration of corrensite but all agree as to its environmental significance of hypersaline conditions of deposition. The occurrence of corrensite in the carbonate rocks at Riasi further substantiates the hypersaline (sabkha) origin for the carbonate sediments (Rao and Khan, 1971). The writers take this opportunity to mention that it is for the first time that corrensite type clay mineral is reported from any geological horizon in India.

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## A NEW SPECIES OF *COPTOSPORA* FROM THE LOWER CRETACEOUS SUBSURFACE SEDIMENTS OF THE CAUVERY BASIN

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The present note deals with the naming of a characteristic spore met within the Lower Cretaceous sediments of Cauvery Basin. Rao & Venkatachala (1971) illustrated *Coptospora* sp. from Dalmiapuram black shale which is dated as Aptian-Lower Albian in age by Venkatachala (1972). In a recent study Venkatachala *et al.* (1972) recorded the occurrence of this species from the Karaikudi and Gandharvakottai wells. This species also occurs in the subsurface of Vridhachalam, i.e., Periyavadavadi, Rupanmarayanaliur and Puvanur shallow wells (Venkatachala, 1972). This fossil is associated with *Polypodiacceoisporites, Microcachryidites, Callialasporites, Classopollis, Podocarpidites, Triletes, Cocksonites, Sestrosporites, Pilosisporites, Polycingulatisporites, Aequitriradites* and other Lower Cretaceous genera. This species is named *Coptospora cauveriana* by the above authors; no formal diagnosis, however was provided by them.

*Coptospora* Dettmann, 1963

*Type Species—Coptospora striata* Dettmann, *1963*

*Coptospora cauveriana sp. nov.*

(Fig. 1, a–f)

Holotype—Rao and Venkatachala, 1971; pl. 3, fig. 18.

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