SELENITE CRYSTALS IN THE SEDIMENTS OFF SAURASHTRA COAST

N. H. HASHIMI

National Institute of Oceanography, Dona Paula, Goa (India) 403 004

ABSTRACT

The occurrence of euhedral crystals of selenite in the inner shelf silty clay sediments off Saurashtra has been recorded. The possible environmental conditions responsible for the formation of these crystals has been discussed and it is tentatively concluded that the selenite developed at or beneath the sediment-water interface as an early diagenetic mineral.

During the study of the coarse fraction (> 62 μ) components of the sediment samples from the western continental shelf, crystals of gypsum (var. selenite) were found in one of the samples at a depth of 25 m collected off the Saurashtra Coast (Fig. 1). Since such crystals of gypsum are not of common occurrence in open ocean sediments, it was considered desirable to describe these crystals and discuss their possible origin. The sediment at this station is a terrigenous silty clay with a high content of skeletal material. The selenite crystals are confined to the mesh sizes +10, +18 and +35. The frequency distribution of the crystals in the different mesh sizes is given below:

Fig 1. Location of the selenite bearing sample.
The crystals are euhedral (Fig. 2A) 0.5–2.0 mm in size with well-developed clinopinacoid (010), prism (110) and negative hemi-pyramid (111), few crystals also show the hemi-orthodome. An interesting feature is the inclusion of two complete shells of the benthonic foraminifera *Ammonia beccari* (Fig. 2B) in one of the selenite crystals.

adjacent waters of the lagoon (Wells, 1962; Murray, 1964; Kinsman, 1966, 1969). In the near shore and off shore areas of India, gypsum has been reported from the sediments of the Gulf of Kutch (Shrivastava, 1970) and in the sediments of the mud banks Kerala (Nair and Murthy, 1968; Krishnanath, 1971). In most tidal flats and in the areas peripheral to the surface bodies of the concentrated waters, gypsum is a subsurface interstitial development and is of displacement rather than replacement origin (Kinsman, 1966). Frequently gypsum crystals develop within the sediments immediately under a saline envi-
Hashimi : Selenite crystal

Within the limits of existing data certain inferences can be drawn regarding the origin of these crystals. The adjacent land areas i.e. Saurashtra region is an arid to semi-arid region where the average rainfall is 750 mm per year. The temperature in the shelf waters adjoining the Saurashtra coast is 28°C and salinity ranges from 35 to 36%. The temperature and salinity do not depart significantly from those in the adjoining regions. Evaporation exceeds precipitation in the northern Arabian Sea but is not intense enough to give rise to salinities higher than three times the normal value which are necessary for the precipitation of gypsum (Deer et al., 1962). Lagoons, where local evaporative conditions might give rise to high salinities are absent on the Saurashtra coast. The tidal flats, however, are of a common occurrence. The evaporation in the associated tidal pools, such as those formed in the corrugated and jagged topography in the Mililiolite limestone occurring on the south-western part of the Saurashtra coast (Shrivastava, 1968), might possibly create local conditions favourable for the precipitation of gypsum. It is, however, unlikely that the gypsum formed in the tidal flats or in the pre-existing sedimentary rocks has been transported to the offshore areas because the crystals are euhedral without any effect of rounding on any faces even though the gypsum has a hardness of two in Moh's scale. Hence it is more likely that the selenite is of in situ origin. An additional evidence against the precipitation of gypsum from the overlying waters is that one of the crystals encloses well preserved shells of the benthonic foraminifera Ammonia beccari. The association of benthonic foraminifera with the crystal further suggests that the selenite crystal enclosed the foraminifers during the course of its growth. In this connection, it is relevant to mention that Kinsman (1966) cited instances of the entire gastropod shells occurring as inclusion in discoidal gypsum crystals of Sabkha sediments of the Persian Gulf and considered it of interstitial in origin.

The available data particularly (a) of prismatic (selenite) nature of the gypsum crystal (b) their occurrence in the shallow water muddy sediments of the inner continental shelf area and (c) the inclusion in the crystal of the shells of benthonic foraminifera, indicate that the gypsum developed at or beneath sediment-water interface as an early diagnostic mineral.

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