

FABRIC AND ORIGIN OF GYPSUM SAND CRYSTALS, LAGUNA MADRE, TEXAS

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ABSTRACT

Gypsum sand crystals of Laguna Madre are crystals of selenite of lens-like, discoidal shape that poikilotopically enclose dominantly terrigenous sand. They occur over a 90-km length of the lagoon as inferred from their presence in spoil islands formed during the excavation of the intracoastal waterway. Sand crystals are most abundant around the region known as the sand bulge, where clean host sand in the lagoon is Holocene wind-blown or storm-washover sand from Padre Island.

Gypsum sand crystals show a spectrum from single crystals (rare) to clusters ("rosettes") of more than 80 contact-twinning crystals, the latter of which may have either a random orientation of crystals or an irregular radial array. Clusters reach 50 cm in length and weigh up to 11 kg. Single crystals and small clusters commonly grew with the largest crystal perpendicular to or at a high angle to bedding, whereas large crystal clusters grew with their long dimension in the plane of bedding. In most sand crystals gypsum grew passively and merely filled pores; these samples have from 41 to 48% cement. Where gypsum precipitated rapidly, it was displacive; these samples have from 50 to 70% "cement," and some centimeters-thick domains are completely free of sand. Growth of gypsum displaced rinds of micrite cement from their sand grain nuclei. SEM examination of sand grains and mollusk fragments from leached sand crystals reveals no evidence of grain corrosion or replacement. If the gypsum cement were to dissolve during further burial, no textural clue to its original presence will exist. Sr isotopic values (< 0.7084) of gypsum cement are below that expected for modern sea water, suggesting either the presence of some meteoric water in the brine or release of nonradioactive Sr from volcanic rock or carbonate rock detritus in the sediments.

If Laguna Madre became hypersaline only 200 years ago, the gypsum sand crystals are very young and they must have grown in years to tens of years. The presence of sand crystals to a depth of at least 4.5 m indicates the gypsum formed subtidally, and their increase in size with depth suggests they formed by seepage reflection of lagoonal brine.

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