

Formation of modern dolomites in a Coastal Hypersaline Pool at Alamain, Egypt

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The studied pool is a part of a coastal system comprising a series of carbonate dune ridges and interdunal sabkha- lagoonal environments. This system was ascribed by many workers to various marine transgressive episodes of the Pleistocene. However, recently ALEXANDERSSON (1990) gave an age of 2100 years before present to the weekly cemented oolites of the coastal ridge.

The hypersaline pool occupies a small semicircular depression behind the coastal ridge. Seawater probably began to accumulate in this depression since 2000-4000 years ago during the last phase of marine transgression. The elevations of the coastal ridge in the study area vary between 2-7 meters. The occurrence of small stream-like channels on the lee side of the ridge lower sections may indicate that seawater could overtop the ridge during storm surges. Yet, the proposed mechanism of lagoon water replenishment is thought to proceed by seepage through the porous matrix of the ridge to replace the amount of evaporated water.

The water depth ranges from few centimeters at the peripheries to about 1.5 meters in the central part of the lagoon. The salinity of water as measured in the late spring was 78 per thousand.

This work is based on the study of 5 representative sediment cores varying in length from 70 to 180 cm. The bulk mineralogical composition was studied principally by X-ray diffraction with the help of DTA when necessary. The organic carbon and carbonate contents were also determined.

On the average the sediment matrix comprise 38% quartz, 8% feldspars, 16% calcite, 15% aragonite, 15% dolomite, 3% Mg-calcite, and occasional occurrences of colestine, glauconite, anhydrite, bassanite, thenardite, huntite, nahcolite and strontianite.

The precipitation of calcite and aragonite throughout the whole sequence indicates that the solution has always been Ca-rich and has been subjected to moderate degrees of evaporation, yet never been desiccated. The promotion of calcite and aragonite deposition raises the Mg level in solution and hence the Mg/Ca ratio. This combined with the low sulphate level and high alkalinity-pH conditions resulting from active sulfate reduction (BAKER and KASTNER, 1981) favors dolomite deposition. The preservation of organic matter even at the deepest core intervals suggests the predominance of low redox environments at the sediment solution boundary throughout the whole depositional history.

The dolomite diffraction pattern always showed a sharp 104 reflection with at least 4 other reflections. Some samples gave reflections of typical dolomite ($d_{104} = 2.886 \text{ \AA}$), but in many cases the 104 peak is slightly displaced to higher 2 θ angles. Evidence from DTA analysis proved that the shift in the peak position was due to substitution of iron for Mg. In fact the presence sometimes of a faint split peak may suggest a physical mixture of Fe-dolomite and normal dolomite.

The variability in the quantity and, perhaps, the type of dolomite with depth intervals in cores may reflect episodic fluctuations in the physico-chemical properties of the precipitating solution, rather than diagenetic reactions. However, the mineral suite indicates that such fluctuations were slight and limited in extent as proved from the rare and occasional occurrences of accessory minerals and the continuous deposition of the principal mineral association.

REFERENCES

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