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Pseudomorphs of Neotethyan Evaporites in Anatolia's HP/LT belts - Aptian basin-wide pelagic gypsum deposits

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Rosetta Marble was defined in SW Anatolia as 3D-radiating textures of dm-to-m-long calcite rods in the HP/LT metamorphosed Mid-Cretaceous pelagic carbonate sequence of the Ören Unit. Rosetta Marble in the type locality are interbedded with meta-chert beds, and may constitute entire carbonate beds. Rare aragonite relicts and Sr-rich, fibrous calcite pseudomorphs after aragonite witness the HP metamorphic imprint of this sequence during the closure of a Neotethyan oceanic domain during latest Cretaceous–Palaeocene times.

We investigated the Rosetta Marble of the Ören Unit, as well as other known and newly found localities in the Tavşanlı and Afyon zones, and the Alanya Massif and Malatya area, to decipher the metamorphic, diagenetic and sedimentologic significance of these uncommon textures. Based on field, petrographic and geochemical investigations, we document a wide variety of Rosetta-type textures. A striking resemblance with well-known gypsum morphologies (e.g. shallow-tail, palm-tree textures) leads us to argue that Rosetta Marble was initially composed of giant gypsum crystals (selenite). The absence of anhydrite relicts of pseudomorphs indicate that gypsum transformed into calcite soon after the deposition by the mean of a sulphate reduction reaction. The gypsum-to-calcite transformation requires that organic matter intervened as a reactant phase. Mid Cretaceous oceanic domains in the Tethyan realm are characterised by overall anoxic conditions that allowed the preservation of organic material.

Rosetta Marble exposures are widely distributed over 600 km along the Neotethyan suture zone. During deepening of the Neotethyan ocean in Mid Cretaceous times, basin-wide and cyclic sedimentation of gypsum and radiolarite occurred. The origin of high-salinity waters needed for gypsum precipitation was located at shelf levels. Density and gravity effects forced the brines to cascade downwards into the deep ocean. Favorable climatic conditions trigger the formation of massive evaporates: hot temperatures during Aptian times, low oceanic circulation and a semi-closed character of the basin.

The findings of massive selenite pseudomorphs located in a pelagic sequence have major impact on paleo-geographic reconstruction of Neotethyan basins in the Eastern Mediterranean during Cretaceous times.