Geophysical Research Abstracts, Vol. 9, 06354, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06354

Dolomite from Miocene lacustrine deposits of the Madrid and Duero basins (Central Spain). Evidences for its microbial origin

M.E. Sanz-Montero 1,3, M.A. García del Cura 1,3, J.P. Rodríguez-Aranda 1 and J.P. Calvo 2

1) Departamento de Petrología y Geoquímica. Facultad de Geología. Universidad

Complutense. 28040-Madrid. Spain. mesanz@geo.ucm.es, 2) Instituto Geológico y Minero. C/ Ríos Rosas, 23. 28003 Madrid. Spain, 3) Instituto de Geología Económica. CSIC-UCM, 28040 Madrid, Spain

This work is centred on dolomite occurrences in different sedimentary successions deposited during the lower and middle Miocene in the Madrid and Duero Basins, Central Spain. The general sedimentary context for the dolomite-bearing formations is well established in mudflat-saline lake systems developed in closed basins. Early diagenetic dolomitization processes have been traditionally invoked to explain the dolomite formation in those sedimentary environments. However, sedimentary, isotopic, mineralogical and petrographic results along with the lack of carbonate precursors support that dolomite was formed as a primary product linked to bacterial activity in microbial mats. Accordingly, the dolomite beds have been interpreted as stromatolites, which occur interbedded with gypsum facies. Authigenic minerals related with the dolomite include pyrite, celestite and/or barite, indicative of sulphate reduction conditions.

The dolomitesare poorly ordered and commonly calcic. Stable-isotope analyses of dolomite samples display negative $\delta^{13}C_{(PDB)}$ average values, ranging from -4.5‰ and -6.5‰. Therefore, the carbonate is significantly enriched in ^{12}C, which supports the incorporation of organically derived carbonates ions in the mineral. By contrast, $\delta^{18}O$ average values oscillate in a wider range, between 2.26‰ and -3.4‰.

As revealed by SEM imagery, micrite-to-microsparite sized dolomite crystals are made of stacked subcrystals that include organic remains, and are characterized by poor crystallized morphologies and high intracrystalline porosity rates. Besides,

dolomite crystals frequently show hollow cores. The epicellular precipitation of dolomite on coccoid bacteria accounted for the formation of these diagnostic textures. Additional observations carry out in the field emission SEM reveal the existence of an intimate linkage between the dolomite crystals and the substrates on which they may rest. This type of relationship suggests that the arrangement of the organic templates plays a role in the formation of dolomite.

In spite of the lithostratigraphic and the spatial variability of the study successions, the dolomite features show a small range of variations, which confirms that microbial imprints can be preserved in the geological record, and validates its use as biomarkers.