Sedimentary and diagenetic processes in the Las Minas de Hellín Gypsum Unit (Upper Miocene, SE Spain)

M. Moragas, E. Playà, L. Rosell & M. Inglès

Dept. Geoquímica, Petrología i Prospecció Geològica, Universitat de Barcelona, 08028-Barcelona, Spain
(mar_moragas@ub.edu, eplaya@ub.edu, lrosell@ub.edu, m.ingles@ub.edu)

The Las Minas de Hellín Gypsum unit (Upper Miocene) in the Las Minas – Camarillas basin (Albacete and Murcia provinces, SE Spain) is studied from the petrological, sedimentological and geochemical points of view in order to interpret the sedimentary and diagenetic processes that affected it. This unit comprises primary evaporites accompanied by a wide variety of diagenetic products, including native sulphur. The primary evaporite lithofacies (i.e., laminated gypsilutites, banded gypsarenites and selenitic gypsum) are associated with host bacterially induced dolomite ($\delta_{13}C_{VPDB}$ from -7.45 to +1.95 ‰ and $\delta_{18}O_{VPDB}$ from +1.54 to +9.20 ‰) and organic matter. The petrological and geochemical characteristics of the primary gypsum facies are in agreement with deposition in a perennial shallow saline lake. The sulphate isotope compositions ($\delta_{34}S_{VCDT}$ from +13.2 to +18.8 ‰ and $\delta_{18}O_{VSMOW}$ from +20.7 to 26.1‰) suggest a dominant contribution of recycled Triassic sulphate in the brines. However, redox processes associated with sulfate-reducing bacterial activity and marine contributions to the basin have also to be considered. The $^{87}Sr/^{86}Sr$ ratios of some samples (+0.708086 and +0.708979) may be consistent either with marine incursions or with hydrothermal contribution associated with Late Miocene volcanic episode in the basin. Bacterial activity was a key process in the sedimentation and diagenetic evolution of the unit and resulted in the formation of native sulphur ($\delta_{34}S_{VCDT}$ from -10.7 to -27.6‰). Besides sulphur, two types of diagenetic gypsum were identified: 1) Megacrystalline secondary gypsum derived from hydration of precursor anhydrite, which occurs only locally; 2) Diagenetic gypsum originated from native sulphur oxidation, as suggested by its sulphate isotope composition (mean values $\delta_{34}S_{VCDT}$ -16.2‰ and $\delta_{18}O_{VSMOW}$ 16.95‰) and by its textural characteristics (coarse- crystalline anhedral texture with high porosity). A significant silicification, related to the magmatic activity that affected the basin, occurred in the upper part of the unit and resulted in the formation of nodules, crusts and thin layers (mainly chalcedony). Moreover, diagenetic carbonates (sparry calcite) with meteoric isotope signature ($\delta_{18}O_{VPDB}$ from -1.72‰ to - 7.89‰), locally replaced the primary gypsum crystals.

Acknowledgements: This research was funded by Project CGL2009-11096.