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Preliminary data concerning the geochemistry of Badenian sea waters that induced the crystallization of evaporitic gypsum in Romania

DELIA-GEORGETA DUMITRAS[1], STEFAN MARINCEA[1], DOINA SMARANDA SIRBU-RADASANU[2], OCTAVIAN G. DULIU[1,3], PÉTER LUFFI[1], AURORA-MARUTA IANCU[1] AND MARTIN DEPRET[4]

[1]Geological Institute of Romania
[2]"Alexandru Ioan Cuza" University of Iasi
[3]University of Bucharest
[4]Université de Liège

The work presents preliminary data concerning the composition of sea waters that precipitated four of the most representative gypsum deposits in Romania. The analyzed samples were taken off from Badenian evaporites located in various geotectonic units: the Transylvanian Basin (Cheia, Cluj County), the Moldavian Platform (Ivancăuți, Botoşani County) and Moldavides (Negreşti, Neamț County, and Moineşti, Bacău County). X-ray powder diffraction, LA-ICP-MS and FT-IR were used to characterize the samples. At Cheia and Ivancăuți, XRD patterns indicate mixtures of gypsum (up to 97 wt.%) and celestite (up to 6 wt.%). The broadening and doubling of the fundamental stretchings of SO_4 groups in gypsum (i.e., the double-degenerated asymmetric stretching n_3 at ~1150 and ~1120 cm^{-1} and the symmetric stretching n_1 at ~1003 cm^{-1}) on FT-IR spectra confirm the co-existence of gypsum and celestite. Pure gypsum from the four deposits was analysed by LA-ICP-MS, as the strontium contents of a gypsum deposit can be used to deduce salinity variations in the mother brines. If the Sr mass fraction denoted the marine-derived precipitation of gypsum within brine body, the small mass fractions of Th and Ti (smaller than the UCC values) could indicate low or absent terrigenous input. The contents of Sr in gypsum from Cheia and Ivăncăuți (545±100 ppm and 931±47 ppm, respectively) are in the range of those recorded from the Mediteranean gypsum (i.e., 500-2000 ppm). The Sr contents are much lower in gypsum from Negreşti and Moineşti, i.e., 289±15 ppm, and 303±16 ppm, respectively, indicating lower salinities. The U and Mg contents are comparable with those in UCC. REE distribution with depletion in MREE and HREE in relation with LREE is typical for gypsum. Low REE sum and LEE enrichment inferred a limited terrigenous influx. The positive Ce/Ce* and Eu/Eu* anomalies can result from adsorbtion of Ce^{4+} and Eu^{3+} by particular matter precipitated from seawater. The deposition of colloidal material on sea bottom reduces the mobility of Ce and Eu and also their mass fraction within seawater. The subsequent transformation of the bottom sediments under anoxic condition from Badenian promoted the reduction of the Ce^{4+} to Ce^{3+} and Eu^{3+} to Eu^{2+}.