

Radiation-induced paramagnetic defects in natural Barite

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Abstract

© SGEM2015. Electron Paramagnetic Resonance (EPR) of paramagnetic defects in natural Barite were attempted to restore the properties of radiation - induced defects as genetic markers. Previously it was shown that structural defects of the crystal are entirely determined by the symmetry elements and translational symmetry of a regular system of points [1]. Point defects are formed due to vacancies of anions and cations of the structure [2]. The concentration of these defects depends from redox conditions of formation the minerals and the dose of the natural irradiation [3]. Valence state of the ion radicals may vary from diamagnetic to the paramagnetic state and vice versa. Barite (BaSO_4), the most common barium mineral, occurs in depositional environments on sea floor, as well as in those on land including biogenic, hydrothermal, and evaporation on land and artificial technogenic. Analysis of the EPR spectra of radicals and impurity ions in barite mineralization and host rocks led to the hypothesis: primary enriched barium solutions were replaced first with calcium, then iron- calcium and, but in the end - iron-containing fluids. At the same time gradually changing their redox potential and sulfate-reducing microbial community develops. Radiation and thermal stability of ESR centers barite has practical significance in various fields of science and industry. The purpose of this study was to show possibilities of the electron paramagnetic resonance (EPR) method on the example of barite rocks identifying indicators going changes.

Keywords

Annealing, Barite, Electron paramagnetic resonance, Organic matter, Radiation