

Nanoscale processes during the interaction of aluminosilicate and carbonate mineral surfaces with acid mine drainage (AMD)

K. KOLLIAS¹, A. GODELITSAS^{1*}, J.M. ASTILLEROS²,
S. LADAS³, S. KENNOU³, C. POTAMITIS^{6,4}, M. ZERVOU⁴,
A. LAGOYIANNIS⁵, S. HARISSOPOULOS⁵,
TH. MAVROMOUSTAKOS^{6,4}

¹Faculty of Geology and Geoenvironment, University of Athens, Panepistimioupoli, 15784 Zographou, Greece

²Faculty of Geological Sciences, Complutense University of Madrid, Ciudad Universitaria, 28040 Madrid, Spain

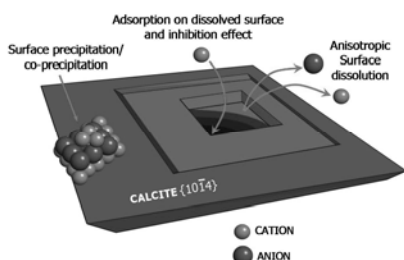
³Department of Chemical Engineering, University of Patras, University Campus, 26500 Patras, Greece

⁴Institute of Organic and Pharmaceutical Chemistry, NHRF, 48 V. Constantinou Av., 11635 Athens, Greece

⁵Institute of Nuclear Physics, NCSR "Demokritos", 15310 Aghia Paraskevi, Athens, Greece

⁶Department of Chemistry, University of Athens, Panepistimioupoli, 15771 Zographou, Greece

Macroscopic experiments (using pH-meter, ICP, XRD, SEM-EDS) have shown that the interaction of aluminosilicate and carbonate minerals with AMD is related to pH increase and subsequent removal of metals such as Fe, Mn, Zn and Pb. The subsequent study of the processes by means of advanced microscopic and spectroscopic techniques (*in-situ* CM-AFM, XPS, RBS, Solid-State MAS-NMR) revealed distinct changes in the nanotopography and the composition of mineral near-surface layers, not particularly related to bulk structural changes. On the other hand, it was indicated that coupled dissolution and sorption (mainly surface precipitation/co-precipitation and adsorption or even absorption) phenomena occur simultaneously at mineral-water interfaces.



Taking into account the above experimental data, generalized figures can be suggested in order to describe in nanoscale the various dissolution and sorption mechanisms taking place during interaction of AMD with aluminosilicate (zeolite) and carbonate (calcite) mineral surfaces.

Fluorite as a marker of REE behavior during hydrothermal ore-forming processes

G.R. KOLONIN AND G.P. SHIRONOSOVA

Institute of Geology and Mineralogy SB RAS, Novosibirsk 630090, Russia (kolon@uiggm.nsc.ru)

In last decades, extensive literature was devoted to the contents of REE and their distribution in fluorite, in particular Monecke *et al.*, 2000., Kupriyanova *et al.*, 2002, that gives a possibility to use these data as a basis for understanding their physical-chemical behavior. In particular, the high level of REE content is typical for early (high-temperature) fluorite in the Erzgebirge Sn-deposits, in Sn- and Be-deposits in the Russian Far East, and in Karaoba W-deposits, Kazakhstan. The general task of this work is to attract authors thermodynamic data (Kolonin, Shironosova, 2006–2008) for interpretation of available natural REE patterns of fluorite in the above deposits. The most papers and discussions concerning REE treat a topic applicable to the anomalous behavior of Eu. We believe that the essence of this problem is not only red/ox conditions but the more general anomaly of this lanthanide element [Cotton, Wilkinson, 1965].

In accordance with our approach, the special attention will be given to the fluid//REE-fluorite interaction based on the data [2007] including the anomalous Eu behavior. In particular, the decrease of Eu minimum in fluorite in the direction from the green core to violet fluorite for the exocontact of cassiterite veins in the Zinnwald deposit can be observed (Monecke *et al.*, 2004). Moreover, the appearance of Eu maximum in fluorite samples from the cassiterite-bearing quartz veins in exocontact of the Ehrenfriedersdorf tin deposit takes place (Monecke *et al.*, 2000). Some other cases of REE behavior in fluorites of Voznesensk Be-deposit and Arsen'evsk Sn-deposit (Far East, Russia), as well as Karaoba W-deposit (Kazakhstan) will be also discussed. In conclusion it can be stated that there is a possibility for interpretation of the many principal peculiarities of REE patterns in fluorites. (Monecke *et al.*, 2000)