Basaluminite aging at different pH and Sulfate Concentrations

A. LOZANO[1*], A. FERNÁNDEZ-MARTÍNEZ[2,3], C. AYORA[1], A. POULAIN[4]

[1]Institute of Environmental Assessment and Water Research, (IDAEA-CSIC). Jordi Girona 18-26, 08034 Barcelona, Spain (*correspondence: alba.lozano@idaea.csic.es)

[2]CNRS, ISTerre, F-38041 Grenoble, France

[3]Université Grenoble Alpes, ISTerre, F-38041 Grenoble, France

[4]ESRF, The European Synchrotron, 71 Avenue des Martyrs, Grenoble, 38000, France

Basaluminite is considered a nanocrystalline mineral which precipitates in acid mine drainage waters and acid sulfate soils when pH increases around 4.5. Since important trace, elements, such as Se, As or Rare Earth Elements (REE) are retained in/on it, basaluminite can have a paramount environmental and economic impact. The systematic SO_4 release at higher pH values indicates possible structure instability. The stability of synthetic basaluminite in aqueous solutions with different pH and SO_4 concentrations has been studied along 81 days. Chemical analysis of the aqueous phase combined to High-Energy X-ray diffraction (HEXD) and Pair Distribution Function (PDF) of the solids have been used to characterize the aging process. Firstly, about 25 % of the SO_4 exceeding from the synthesis is desorbed during the first hours of contact with a background solution. Then, for pH values higher than 5.1, basaluminite transforms into Al-hydroxides, such as nanoboehmite, with a progressive increase in crystallinity with pH. Thus, for pH of 6.4, basaluminite is completely transformed in nanoboehmite after 81 days. For high SO_4 concentrations, the transformation to nanoboehmite is partially inhibited. The strong similarity between the local order of basaluminite and amorphous $Al(OH)_3$ questions the identification of the former as a mineral species.