Martin Luther Universität Halle-Wittenberg
Institut für Geowissenschaften
Mineralogie/Geochemie
Prof. Dr. Dr. H. Pöllmann
von-Seckendorff-Platz 3, 06120 Halle,
Tel: +49.345.5526111, Fax:+49.345.5527180,
e-mail: herbert.poellmann@geo.uni-halle.de

Thesis (diploma)

Nina Rosenkiewitz

"Synthesis and characterization of lithium aluminum layered double hydroxides (LDHs)"

Introduction

The chemical formula of layered double hydroxides (LDHs) compounds is represented by:

$[M_x^{+1/+2}M_y^{3+}(OH)_6] + [A_{l/n}]^{n-} * zH_2O$.

The structure is derived from the Brucite structure $Mg(OH)_2$. This is composed of metal cation layers with similar ion radii which form $[M^{2-}/M^{3-}(OH)_6]^{x-}$-octahedrons together with their next neighbours. Two-dimensional layers are formed by the linkage between the octahedrons' edges.

Between these layers different amounts of water molecules occure due to p,T-conditions. The octahedrons are stabilized by hydrogen bonds between the hydroxyl ions. The charge of the layer is variable. The negative charged intermediate layer neutralizes the positively charged main layer. It is possible to substitute a wide variety of inorganic anions into the interlayer.

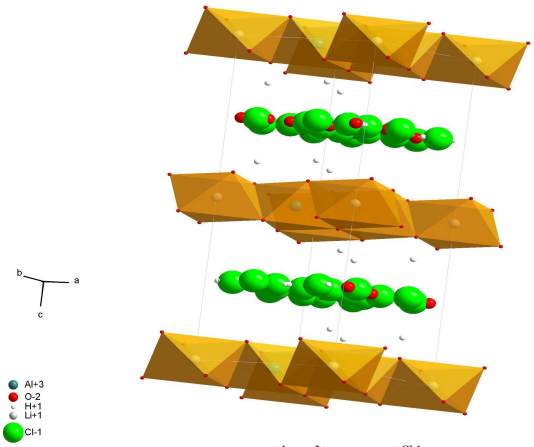

Abb.: Crystal structure of $[Li^{+1}Al_2^{3+}(OH)_6]^{+}Cl^{1-} * nH_2O$

Objective

The intention of this study is to synthesize and characterize Li-Al-LDHs with different incorporated inorganic anions by direct synthesis as well as anion exchange via a precursor phase.

The octahedrally coordinated metal hydroxide places are occupied in a relationship of 3:1 and resulting in the following formula:

$[Li^{+1}Al_2^{3+}(OH)_6]^{+}[A_{l/n}]^{n-} * zH_2O$

Where "A" can be replaced by the following inorganic anions: OH^-, Cl^-,Br^-, I^-, NO^-_3, BO_3^{3-}, CO_3^{2-}, ClO^-_3, CrO_4^{2-}, SO_4^{2-}, SeO_4^{2-}, MnO^-_4. After synthesis of the pure phases the compounds can be characterized by XRD, REM, IR spectroscopy and thermal analysis.

Literatur

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