Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11700, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11700
EGU General Assembly 2008

Crystallization and solid solution formation of Mg-/ Zn-/ Cu- Al (CO_3) hydrotalcite.

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Hydrotalcite and similar layered double hydroxides (LDHs) play an important role in the formation of so-called “reservoir minerals” for immobilization of cations and anions of environmental relevance. Very scarce information is available on their thermodynamic properties to rationalize the use of LDH materials for trace metal immobilization. Our present work focuses on the preparation and characterization of LDHs and also experimental determination of their thermodynamic properties. The obtained thermochemical data is necessary when LDH phases need to be included in geochemical models of nuclear waste disposal environmental.

Seven series of LDH compounds of the type $[M(II)_{1-X}M(III)_X(OH)_2](A_{n-})_{X/n}{\cdot}mH_2O$ with M(II) = Mg^{2+}, Zn^{2+}, Cu^{2+}, where M(III) = Al^{3+}, and A^{n-} = CO_3^{2-} (hydrotalcite-like materials) have been prepared. The materials were synthesized by the conventional method called constant coprecipitation. In this method M(II)/M(II) and Al nitrate solutions (as total ions concentration is 1 M) were mixed under basic conditions ($NaOH/Na_2CO_3$), maintaining a constant pH $\sim$ 9-10 and temperature $\sim$35-40 ˚C. The precipitate was placed in a Teflon cell of a hydrothermal stainless steel bomb and aged in an oven for 6 days at about 100 ˚C in order to enhance the product crystallinity. The samples were then characterized by Infrared Spectroscopy, Powder X-ray Diffraction, DTA/TG and AAS. The sample characterization confirms hydrotalcite-like compounds solid solution series. The dissolution experiments were carried out by dissolving two different M(II) -LDHs in 100 ml of water with 0.1 M $NaNO_3$ as a background electrolyte at 25 and 50 ˚C. Throughout the experiment the carbonate concentration was kept at constant pressure (P_{CO_2}= 1 bar). The samples are well characterized by powder XRD and AAS to see

any change in structure and chemical composition after the dissolution experiment.