
Synthesis of Hydrotalcite-Like Compounds and their Physico-Chemical Properties—The Systems $\text{Mg}^{2+}\text{-Al}^{3+}\text{-SO}_4^{2-}$ and $\text{Mg}^{2+}\text{-Al}^{3+}\text{-CrO}_4^{2-}$

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Abstract: Hydrotalcite-like compounds $[\text{Mg}_{1-x}\text{Al}_x(\text{OH})_2]^{x+} [\text{A}_{x/2}^{2-}, m\text{H}_2\text{O}]^{x-}$, where A^{2-} is SO_4^{2-} or CrO_4^{2-} and $x \neq 0.25$, were prepared by a coprecipitation method and their physico-chemical properties were studied by X-ray diffraction, thermal analysis, i.r. absorption spectra and acidity-basicity measurement.

The compounds including SO_4^{2-} and CrO_4^{2-} were analogous to an orthorhombic hydrotalcite and the lattice constants, a_0 and c_0 were 3.05 and 25.97 Å, and 3.05 and 26.48 Å, respectively. The crystallite size and strain in the 003 direction were 127 Å and 4.77×10^{-2} for the SO_4^{2-} system or 83 Å and 6.60×10^{-2} for the CrO_4^{2-} system, indicating a largely distorted microcrystallite. Two endothermic peaks observed at 240 and 455° C for the SO_4^{2-} system and at 230 and 460° C for the CrO_4^{2-} system are ascribed to the eliminations of interlayer water ($m\text{H}_2\text{O}$) and structural water, respectively. The compound including SO_4^{2-} formed MgO by calcination at 500° C and MgSO_4 and MgAl_2O_4 by calcination at 800° C while the compound including CrO_4^{2-} formed MgO at 400° C and $\text{MgAl}_{2-x}\text{Cr}_x\text{O}_4$ at 800° C. I.r. study of the SO_4^{2-} compound indicated that the bonding of SO_4^{2-} was a bridge type. The highest acid and base strengths of the SO_4^{2-} compound were $\text{H}_0 \leq 1.5$ and $\text{H}^- \geq 12.2$, the acidity and basicity being 0.3 and 0.1 mmol/g, respectively.

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