INFLUENCE OF SYNTHESIS CONDITIONS ON ZNO/$ZN_5(OH)_8CL_2.H_2O$ FORMATION

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Abstract

Simonkolleite occurs as an oxidation product of zinc in presence of Cl^- anions. It has the formula $Zn_5(OH)_8Cl_2.H_2O$ and a layered structure similar to $Zn(OH)_2$ where OH^- groups are partially replaced by Cl^- anions. Simonkolleite and other layered zinc hydroxide compounds are interesting as potential catalyst supports, drug carriers, UV and visible light absorbers, and corrosion inhibiters. They can be used for many applications such as filler for polymeric systems, or catalysts support. Simonkolleite can be produced by a simple sol-gel process using $ZnCl_2$ and NaOH in water solutions, at low temperature. When a stoichiometric amount of Zn to OH^- of 5:8 (in mols) is used, a non negligeable part of ZnO is produced with the simonkolleite. With an increasing amount of OH^-, ZnO is preferentially produced to simonkolleite. Although the formation mechanism of simonkolleite is not clear, a possible mechanism could consist in two main steps: a first formation of the layered precipitate $Zn(OH)_2$. In a second step, OH^- groups could be partially replaced by Cl^- anions to form simonkolleite. A parallel and competitive second reaction reaction is the formation of the tetracoordinated complex $Zn(OH)_{42-}$, which further dehydrate and dehydroxylate to form ZnO. In this study, we try to find which is the optimal initial ratio of reactants allowing to obtain pure simonkolleite while having a maximum theoretical yield.

Keywords: Simonkolleite, zinc hydroxide chloride, layered zinc hydroxide, sol-gel process

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