

---

# Formation of Spinel from a Hydrotalcite-Like Compound at Low Temperature: Reaction between Edges of Crystallites

Toshiyuki Hibino and Atsumu Tsunashima

Materials Processing Department, National Institute for Resources and Environment, 16-3 Onogawa, Tsukuba, 305 Japan

**Abstract:** The thermal decomposition behavior of hydrotalcite-like compounds (HTlc) prepared by reconstruction of calcined HTlcs is described. From the results of X-ray diffraction (XRD), it seems that dicarboxylate intercalates of HTlc calcined at 500 ° C are completely reconstructed to Mg-Al-CO<sub>3</sub> HTlc by exposure to aqueous Na<sub>2</sub>CO<sub>3</sub>. However, the Mg-Al-CO<sub>3</sub> HTlc reconstructed under particular conditions yields spinel (MgAl<sub>2</sub>O<sub>4</sub>) at 400 ° C. This temperature is very low, because Mg-Al-CO<sub>3</sub> HTlc that has been reported yields spinel at 900 ° C after forming a Mg-Al double oxide. The reconstructed Mg-Al-CO<sub>3</sub> HTlc that yields spinel at 400 ° C is obtained when the following conditions are fulfilled: the crystallites of the starting dicarboxylate intercalates are coagulated tightly and the calcined HTlcs and reconstructed materials are not ground. The Mg-Al-CO<sub>3</sub> HTlc reconstructed under these conditions contains only 55– 70% of carbonate anions required by stoichiometry. Therefore, we conclude that the transformation of reconstructed Mg-Al-CO<sub>3</sub> HTlc to spinel at 400 ° C is the result of a reaction occurring between edges of crystallites.

**Key Words:** Double Hydroxide • Grinding • Hydrotalcite • Reconstruction • Spinel • Thermal Decomposition

*Clays and Clay Minerals*; December 1997 v. 45; no. 6; p. 842-853; DOI: [10.1346/CCMN.1997.0450608](https://doi.org/10.1346/CCMN.1997.0450608)  
© 1997, The Clay Minerals Society  
Clay Minerals Society ([www.clays.org](http://www.clays.org))

---