Intercalation of N-Alkyltrimethylammonium into Swelling Fluoro-Mica

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Abstract: Trimethylammonium ions (TMA⁺) with formula $CH_3(CH_2)_{n-1} N^+(CH_3)_3$, with n = 4, 8, 12, 16, 18 and 22 were intercalated into synthetic Li-fluorotaeniolite (Li-FTN) and Li-fluorohectorite (Li-FHT) by cation exchange. The products were analyzed by thermogravimetric (TGA) and X-ray powder diffraction (XRD). XRD patterns exhibited variable (001) spacings of the TMA⁺/mica complexes depending upon the exchange ratio of TMA⁺/Li⁺ and the carbon number of TMA⁺. Detailed inspection of these XRD patterns clarified the structures of the complexes and also the intercalation mechanism, as follows: The fundamental structure of the complexes is the commonly known intercalation structure where the " paraffin-type bilayers" of TMA⁺ are in the mica interlayer and their long chains incline at approximately 30° to the silicate sheet. This structure appeared at the final stage of the intercalation reaction. During the intermediate stage of the reaction, units of this structure and those of hydrated mica formed randomly and regularly interstratified structures. Variable (001) spacings in XRD patterns showed the structural change of the complex with an increasing number of TMA⁺-intercalated units.

Key Words: Fluoro-Mica • Intercalation • N-Alkyltrimethylammonium • XRD Cation Exchange

Clays and Clay Minerals; August 1996 v. 44; no. 4; p. 501-505; DOI: <u>10.1346/CCMN.1996.0440408</u> © 1996, The Clay Minerals Society Clay Minerals Society (<u>www.clays.org</u>)