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Octahedral versus tetrahedral coordination of Al in synthetic micas determined by XANES

Annibale Mottana,[1] Jean-Louis Robert,[2] Augusto Marcelli,[3] Gabriele Giuli,[4] Giancarlo Della Ventura,[1] Eleonora Paris,[5] and Ziyu Wu[6]

[1]Dipartimento di Scienze Geologiche, Università di Roma Tre, Via Ostiense 169, I-00154 Roma RM, Italy
[2]Centre de Recherche sur la Synthèse et la Chimie des Minéraux, C.N.R.S., 1A rue de la Férollerie, F-45071 Orléans Cedex 2, France
[3]Laboratori Nazionali di Frascati, Istituto Nazionale di Fisica Nucleare, Via E. Fermi 13, I-00044 Frascati RM, Italy
[4]Dottorato di Ricerca in Mineralogia e Petrologia, Universita' di Firenze, Via G. La Pira 4, I-50121 Firenze, Italy
[5]Dipartimento di Scienze della Terra, Università di Camerino, Via Gentile III da Varano, I-62032 Camerino MC, Italy
[6]Institut des Matériaux de Nantes, Laboratoire de Chimie des Solides, 2 rue de la Houssinière, F-44072 Nantes Cedex 03, France

Abstract

We used the JUMBO monochromator at SSRL to measure the Al *K*-edge X-ray absorption spectra of synthetic micas having variable Al content and occupancy, from 0 to ⅔ in the octahedral M positions, and 0 to ¼ in the tetrahedral T positions. The measured Al *K* edges differ markedly, but the differences may have a common explanation: (1) Micas containing ⅓ Al in M or 1/4 Al in T have *K* edges that differ in the energy and intensity of the first two features, which are related to interaction of Al with its first-shell nearest neighbors (O and OH or F). They are nearly identical to the *K* edges of reference minerals such as albite (tetrahedral Al only) or grossular (octahedral Al only). (2) Micas containing Al in both M and T have *K* edges that can be interpreted as a weighed combination of the simple edges.