
Structural Study of a Benzidine-Vermiculite Intercalate Having a High Tetrahedral-Iron Content by ^{57}Fe Mössbauer Spectroscopy

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Abstract: ^{57}Fe Mössbauer spectra obtained at room temperature and 78 K for natural Mg-saturated, Ca-saturated, and benzidinium-intercalated vermiculite having a high tetrahedral iron content are presented. For all samples the spectra were computer-fitted with five overlapping doublets, representing Fe in both tetrahedral and octahedral sites. One doublet has parameters consistent with the weathered ilmenite known to be present as inclusions. For the intercalated vermiculite, the δ value of the doublet assigned to the tetrahedral Fe^{3+} increased with respect to the untreated sample, suggesting that the electron densities about the Fe sites had decreased following intercalation. A charge movement from the silicate layers towards the interlayer monovalent benzidinium ions is also implied. The direction of this charge movement is opposite to that found when blue monovalent radical cations form on montmorillonite surfaces. The Mössbauer evidence suggests the absence of an interlayer- Fe^{3+} complex.

Key Words: Benzidinium ion • Intercalate • Iron • Mössbauer spectra • Vermiculite

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