
The Coordination of Aluminum Ions in the Palygorskite Structure

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Abstract: NMR spectra of PF1-1 Floridan palygorskite strongly suggest that Al^{3+} occurs only in octahedral coordination. X-ray microanalysis of the palygorskite fibers indicate a chemical composition defined by the atomic ratios: $\text{Mg/Si} = 0.34$, $\text{Al/Si} = 0.27$, and $\text{Fe/Si} = 0.04$. Considering the NMR and CEC data in this report along with the previously published results of IR and Mössbauer spectroscopic studies, the following structural formula is proposed for PF1-1 palygorskite: $(\text{Mg } 2.12 \text{ Al } 1.68 \text{ Fe } 3+ 0.96) \text{Si } 8 \text{ O } 20 (\text{OH}) 2 (\text{OH } 2) 4$ where \square represents the vacant MI octahedral sites in the structure, and Al^{3+} and Fe^{3+} are all exclusively assigned to the octahedral sites.

Key Words: Al-coordination • MAS-NMR • Palygorskite

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