
Mössbauer Studies of Palygorskite and Some Aspects of Palygorskite Mineralogy

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Abstract: Fe³⁺ ions in palygorskite occupy sites at the edges and in the interior of the alumino-silicate chains. The Mössbauer parameters of the doublets associated with Fe³⁺ ions in edge sites indicate that the sites have a regular 6 coordination. Fe³⁺ ions in the interior of the chains occupy M(1) sites in three of the samples examined and M(2) sites in the fourth. Fe³⁺ ions in edge positions of palygorskite become 5-coordinated when water is lost on heating. They maintain this coordination on dehydroxylation, probably by cross-linking of the chains. The temperatures at which changes occur in the X-ray powder diffraction patterns and the Mössbauer and infrared (IR) spectra differ from sample to sample. The intermediate stages observed also vary, either due to different reaction paths or to different stabilities of the intermediate phases. The deduced distribution of cations in the octahedral sheets is in good qualitative agreement with the observed IR hydroxyl absorptions.

Key Words: Infrared spectroscopy • Iron • Mössbauer spectroscopy • Palygorskite • Sepiolite • Thermal treatment • X-ray powder diffraction

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