Infrared Studies of Surface Acidity and Reversible Folding in Palygorskite

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Abstract: The infrared absorption spectra of a palygorskite sample from Cáceres, Spain, showed two previously unreported bands in the OH-stretching region at 3420 − 3440 and 3220 − 3230 cm^{-1} after evacuation at 90 ° − 23 ° C. These bands, which reached maximum intensity after the sample was heated at 150 ° C, were assigned to OH in the H : Si-O-Si and H : Si-O-Al groups, respectively. To characterize the nature of these OH groups, pyridine was adsorbed on the sample. The resultant spectra suggest that at 150 ° C the palygorskite folded and OH groups protonated, resulting in the formation of a deformed pyridinium ion between 150 ° and 290 ° C. A high concentration of thermally stable Lewis-acid sites on the surface of the palygorskite was also noted.

Key Words: Infrared spectroscopy • Lewis-acid sites • Palygorskite • Protonation • Pyridine

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