
Absorption of Infrared Radiation by D₂O and HDO Mixed with Montmorillonite¹

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Abstract: The frequency, ν , for O-D stretching in D₂O films between the superimposed layers of different micas and montmorillonites was measured at several film thicknesses and temperatures of 2° and 25° C by infrared spectroscopy. The molar absorptivity, ϵ , for O-D stretching in HDO films between the montmorillonite layers was also measured at different film thicknesses and 25° C. It was found that ν is related to m_w/m_m , the mass ratio of D₂O to mica or montmorillonite, by the equation $\nu = \nu^0 \exp \beta/(m_w/m_m)$ where ν^0 is the O-D stretching frequency in pure D₂O and β is a constant. Since m_w/m_m is proportional to a , the area under the absorption peak, m_w/m_m can be replaced by a in this equation. It was also found that ϵ decreased dramatically as the thickness of the water film between the montmorillonite layers decreased. These results were interpreted to mean that the structure of the interlayer water is perturbed by the interlayer cations and/or silicate surfaces.

Key Words: Absorption • Deuterium • Infrared • Molar absorptivity • Montmorillonite • Water

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