
Effect of Pressure on the Sorption of Yb by Montmorillonite

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Abstract: X-ray diffraction, infrared, and cation-exchange capacity measurements of the reaction products of montmorillonites with $\text{YbCl}_3 \cdot 6\text{H}_2\text{O}$ show that at 1 atm irreversible sorption of Yb^{3+} increases with increasing temperature in the range 20° to 280° C, whereas at 110atm it decreases with increasing temperature. Above 100° C, less irreversible sorption occurs at 110 atm than at 1 atm. The decreased sorption at high pressure is attributed to reduced cation hydrolytic fixation and to rapid expulsion of interlayer Yb^{3+} by interlayer water at higher temperatures, with a concomitant decrease in Yb^{3+} migration to octahedral sites. At 110 atm, 160° and 200° C treatments cause changes in infrared absorption bands (884 cm^{-1} , 848 cm^{-1}) suggesting that sorbed Yb^{3+} is charge compensated by the deprotonation of Fe^{3+} - and Mg^{2+} -hydroxyl groups. At 290° C deprotonation is restricted to Fe^{3+} -hydroxyl groups.

Key Words: Cation fixation • Deprotonation • Infrared spectroscopy • Lanthanides • Ytterbium

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