

---

# Dehydration of K-Exchanged Montmorillonite at Elevated Temperatures and Pressures

A. F. Koster Van Groos and Stephen Guggenheim

Department of Geological Sciences, University of Illinois at Chicago, Chicago, Illinois 60680

**Abstract:** The dehydration temperature of K-montmorillonite, obtained by ion exchange of a Na-montmorillonite, was determined at pressures to 2 kbar, using high-pressure differential thermal analysis. Dehydration reactions were found at about 50° and 100° C above the liquid-vapor curve of water. At pressures above the critical point of water the dehydration temperatures increased only slightly. The temperature of the first dehydration reaction is 10° C higher than for Na-montmorillonite, indicating a slightly greater stability of the hydration shell around the potassium interlayer cation. The second dehydration reaction occurs at a slightly lower temperature. The data were used to determine the enthalpy of the dehydration  $\Delta H_{(dh)}$  and the bonding enthalpy of the interlayer water  $\Delta H_{(iw)}$  at 1 atm. The first dehydration reaction of the K-exchanged montmorillonite has a  $\Delta H_{(dh)} = 46.16 \pm 0.06$  kJ/mole and a  $\Delta H_{(iw)} = 7.8 \pm 0.5$  kJ/mole, whereas for the second reaction,  $\Delta H_{(dh)} = 56.7 \pm 2$  kJ/mole and  $\Delta H_{(iw)} = 19.8 \pm 2$  kJ/mole. These values compare with a  $\Delta H_{(dh)} = 46.8 \pm 0.3$  kJ/mole and a  $\Delta H_{(iw)} = 7.8 \pm 0.5$  kJ/mole for the first dehydration reaction of the Na-montmorillonite and a  $\Delta H_{(dh)} = 62.9 \pm 2$  kJ/mole and  $\Delta H_{(iw)} = 27.1 \pm 2$  kJ/mole for the second dehydration.

**Key Words:** Dehydration • Differential thermal analysis • Enthalpy • Montmorillonite • Potassium • Pressure

*Clays and Clay Minerals*; June 1986 v. 34; no. 3; p. 281-286; DOI: [10.1346/CCMN.1986.0340308](https://doi.org/10.1346/CCMN.1986.0340308)

© 1986, The Clay Minerals Society

Clay Minerals Society ([www.clays.org](http://www.clays.org))

---