

SORPTION OF METAL CATIONS ON MONTMORILLONITE: AN EPR STUDY USING CU(II) AS A SPIN PROBE

1HYUN, S.P., 2CHO, Y.H., 1KIM, S.J., and 2HAHN, P.S., 1Seoul Nat'l Univ.; 2KAERI

Metal cation sorption on montmorillonite was studied with electron paramagnetic resonance (EPR) spectroscopy using Cu(II) as a sensitive spin probe. The major sorbed species were successfully identified by EPR spectroscopy as they showed distinct signal due to their strength of binding and local structure. The EPR results together with macroscopic sorption data show that the sorption involves at least three different mechanisms. The dominant sorption mechanism changed with pH and Na⁺ content in solution. In the acidic pH range, the sorption is independent of pH but is dependent on Na⁺ concentration. The sorbed Cu(II) shows isotropic absorption line like an aqueous Cu(II). It is thought that the Cu(II) is ion exchanged in the interlayer site and is capable of free tumbling motion in spite of electrostatic binding force. In the near neutral pH range, the sorption is strongly pH dependent and the sorbed Cu(II) shows no EPR signal. It is interpreted that the Cu(II) is sorbed by a surface complexation mechanism to form an inner-sphere surface complex. The EPR spectrum with a dipolar splitting pattern means that the dimeric Cu(II) surface species is the dominant sorbed species in the basic pH region where the Cu–Cu internuclear distance of the dimer is estimated to be ~3.3 Å.