



Migration of copper in micro- and meso-pores

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To better understand the transportation of copper in the pores of a soil, speciation of copper migrated between micro- and meso-pores at the temperature range of 273-323 K has been studied by in situ X-ray absorption near edge structure (XANES) and extended X-ray absorption fine structure (EXAFS) spectroscopy. A biporous molecular sieve containing both micropores (0.5 nm) and mesopores (4.1 nm) has been synthesized and used to simulate the pore system in the soil. Nanosize copper can be migrated and enriched in the mesopores. Nevertheless, to facilitate the diffusion into the micropores, an enhanced dissolution of the copper particles to form Cu^{2+} is observed by XANES. The Cu^{2+} can also be adsorbed on the surfaces of the molecular sieve as the Cu-O-Si bonding is found by the EXAFS. This work also exemplifies the utilization of in situ X-ray absorption spectroscopy to reveal migration of nanoparticles or cations in the micro- and meso-pore systems.