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Effects of nanoparticle size on mechanisms of Cd sorption to hematite KALPANI WERELLAPATHA, University of Notre Dame, Department of Physics, KESHIA KUHN, PATRICIA MAURICE, University of Notre Dame, Department of Civil and Environmental Engineering, BRUCE BUNKER, University of Notre Dame, Department of Physics, DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING COLLABORATION, MATERIAL RESEARCH COLLABORATIVE ACCESS TEAM, SECTOR 10, ADVANCE PHOTON SOURCE, ARGONNE NATIONAL LAB. COLLABORATION — Hematite nanoparticles (NPs) are ubiquitous in soil and have high sorption capacities for cationic and anionic contaminants. We investigate the effects of hematite NP size (8 nm and 40 nm) on sorption mechanisms of cadmium. Because 8 and 40 nm hematite NPs have substantially different specific surface areas, experiments were run in two ways: normalized to NP mass (MN) or to total NP surface area (SAN). Cd (II) sorption increased as the particle size was decreased with increasing pH environment. X ray absorption spectroscopy (XAS) results suggested Cd was adsorbed to 8nm particles at pH 7.5 but did not form a precipitate whereas at pH 9, minor amounts of Cd precipitation was present. In SAN experiments, particle size did not substantially affect the sorption mechanism of 40 nm NPs at pH 7.5 whereas Cd precipitate dominated at pH 9. In MN experiments, Cd precipitation dominated in 40 nm NPs at both pH values. In conclusion, NP size affects both the extent and mechanism of Cd sorption on hematite NPs and attention must be paid for differences in NP mineral surface area in experimental design. .

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