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# NANOSTRUCTURE AND ADSORPTION BEHAVIOR OF NATURAL/SYNTHETIC ALLOPHANES

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Nature has been performing nanotechnology from time immemorial. The library of nature has plenty of recipes for the design and construction of nano-scale materials and devices of actual and potential benefit to human existence. The allophane, a group of hydrous aluminosilicate whose primary particles are made up of hollow spherules with a diameter of 3.5-5 nm, was known long before the discovery in 1985 of buckminsterfullerene (C60). We have investigated the potential of the natural and synthetic allophanes, respectively, in adsorbing metal ions (Cu, Cd, Pb, V), phosphate, arsenic, oxygenated/sulfur compounds, and non-ionic organic compounds (naphthalene, 17?-estradiol as an endocrine-disrupting chemical) of environmental and health concerns. The sorption is a combined result of cation-exchange reaction and specific complexation between metal ions and the wall perforation of (OH)Al(OH2) groups of allophane. Structural characterizations of allophane and allophane/metal ion complexes will be performed using high-resolution TEM, solid-state NMR and XRD techniques and especially improvements in quantitative methods of data analysis. Modeling techniques like electronic structure calculation, ab-initio molecular dynamics, Monte Carlo, molecular dynamics were utilized in this study to investigate the adsorption mechanisms.