

Forefront Issues in Environmental Science: The Application of Nanoscience to Environmental Geochemistry

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Nanoscience is a relatively new field of research that primarily includes the determination and explanation of the properties of matter in the size range of roughly one to 100 nanometers, the so-called nanoscale. Mechanical, electrical, thermodynamic, and other properties are strongly modified as the physical dimensions of a material enters the nanoscale, and researchers in the field are just beginning to catalog and understand these property modifications in this fuzzy area between the classical (bulk) and quantum domains. It is also becoming more and more apparent that many Earth materials exist in the nanodomain as minute particles or thin films, especially in low-temperature environments, but also in mid- to high-temperature environments. As examples, this presentation describes how nanoscience has begun to be applied to mineral weathering, mineral-bacteria interaction, and metal transport in acid mine drainage systems. Yet this is only the beginning. The future directions of nanoscience in geochemistry will include a determination of the identity, distribution, and properties of nanosized particles in aqueous and soil systems, thin films in both low- and high-temperature systems, and nanosized features on mineral surfaces, all with important environmental consequences.