Dipartimento di Scienze e Tecnologie

Dottorato di Ricerca in Scienze e Tecnologie per l'Ambiente e la Salute

Seminari ed incontri del DST

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The Role of Mineralogy in Radioactive Waste Isolation: Yucca Mountain, Nevada

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Via Port'Arsa, 11, Benevento

The concept of a radioactive waste repository generally involves both engineered (man-made) barriers and geologic barriers to minimize the long-term migration of waste from the repository. The minerals at Yucca Mountain (or any repository) are an integral part of the geologic barrier to the migration of radionuclides, and understanding the distribution of reactive and potentially sorptive minerals is crucial to modeling the long-term performance of the repository. Zeolites, abundant at Yucca Mountain, have traditionally been considered to be important in retardation of the migration of cationic radionuclides such as 137Cs and 90Sr. However, most of the radioactive species of concern (with longer half lives) are not those that would be readily sorbed by natural zeolites. The most important radionuclides are thus anionic species and long-lived actinides that often form large, complex aqueous species, both of which are not strongly sorbed by cation exchangers such as zeolites. Zeolites play an important role in a repository at Yucca Mountain for several other reasons, including acting as important sources and sinks of water and thermal energy during heating and cooling in the vadose zone, causing changes in rock properties due to dehydration/hydration reactions and their accompanying volumetric changes, and participating in long-term reactions, e.g., of clinoptilolite to analcime, that can give rise to large volume reductions and production of water and silica. Thus the importance of minerals extends far beyond cation exchange by zeolites to phenomena affecting the entire thermohydrologic system.

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