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## ACTINIDES AND THE ENVIRONMENT: WHAT WE KNOW AND WHAT WE NEED TO KNOW

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Due to nuclear testing, reentry and disintegration of nuclear powered satellites, nuclear reactor accidents, uranium mining and processing, and nuclear weapons production, actinides have been introduced into the environment. Proposed disposal of high-level radioactive waste in mined repositories in geologic formations as well as the storage and disposal of uranium and plutonium from weapons dismantlement are further possible sources for actinide releases to the environment. In order to design methods for the cleanup of contaminated sites, predict the transport behavior in the environment, perform safety assessment studies to determine the ability of repositories to adequately contain them, and design ways to retard their release and migration rates, it is essential to understand the chemical behavior and forms of actinides under environmental conditions.

Excluding gaseous and airborne transport, actinides can migrate in the environment mostly via aqueous media such as groundwater and surface, river, lake and sea water. Models predicting the hydrological transport through the environment require as input an actinide concentration, the true amount that is actually available for transport. It is defined as the actinide source term and not as true solubility, because it may be a combination of dissolved and colloidal material. Three major processes define the actinide source term: (1) solubility, (2) organic interaction, and (3) sorption. They are dependent on each other and each individual process is the result of several sub-processes. Also, colloid formation plays a major role in the actinide source term, and it is common to each of the three main processes. The current state of knowledge of these processes will be discussed and areas will be outlined where additional information is required.