A mechanism of container sinking in bentonite buffer hitherto not considered

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One of the major concepts of the geological disposal of high level radio active waste is to enclose a metallic container by bentonite buffer which is considered to be impermeable and chemically stable. Since the average density of the container is around 6 to 7 and very heavy, the scenario of container sinking has been evaluated because excess sinking shortcuts the pathway of nuclide migration in the bentonite and is detrimental to the bentonite buffer functions. Previous considerations of container sinking have been through the mechanical deformation of the bentonite. In this presentation, a chemical deformation mechanism is presented as another scenario of container sinking, which has not been previously considered in the rad-waste disposal field. Chemical deformation here is the deformation through the pressure solution of minerals constituting the buffer, transportation by diffusion, and precipitation. That such chemical deformation is a ubiquitous phenomenon occurring in various scales in the crust of the earth will be shown through the review of previous works. It will also be shown that such chemical deformation can occur at the range of the pressure and temperature of the geological disposal. It is deduced that container sinking scenario needs to be evaluated also from the viewpoint of chemical deformation of the bentonite, because the sinking distance can be significantly large in the time range of up to a million years for the safety assessment.

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