Sorption analysis of Cesium and Iodide ions on un-weathered Pumic Tuff

RAJIB, Mohammad[1*], Takayuki Sasaki[2]

[1]Graduate School of Science and Engineering, Saitama University, [2]Department of Nuclear Engineering, Kyoto University

Understanding and modeling of the sorption behavior onto the host rock under various groundwater conditions are indispensable in the reliable safety assessment of radioactive waste disposal. Pumice tuff has been considered as a potential host rock for geological disposal of radioactive waste. As such, sorption mechanism of two very important nuclides, Cesium (Cs) and Iodine (I), on the pumice tuff under various subsurface geochemical environment e.g. the influence of pH, ionic strength, and the initial concentrations on the sorption of Cs and I on tuff and pumice isolated from the original, unweathered pumice tuff rock was investigated by batch method at an aging period of about 10 weeks. It was observed that for both rocks, the proton concentration has little effect on the distribution coefficient, K_d values for Cs in the pH range 3?10. As the ionic strength of the solution increases in the presence of sodium perchlorate as a matrix ion, the K_d value of cesium apparently decreases, reflecting the competition of the electrolyte Na^+ with the specific sorption of Cs^+ on the negatively charged sites. In contrast, no significant dependence of ionic strength on the K_d of anionic iodine was found. A simple surface complexation model without considering electrostatic works was applied to simulate the sorption of ions on rocks, and the model parameters were determined. The K_d values at the given chemical conditions were estimated using the parameters and compared with the ones in the literature.

Keywords: Cesium, Iodide, Sorption, Surface complexation model, Tuff, Pumice