

2-3 Development of Reliable Databases for Safety Assessment of High-Level Radioactive Waste Disposal System

— Database Development for Radionuclide Migration Analysis —

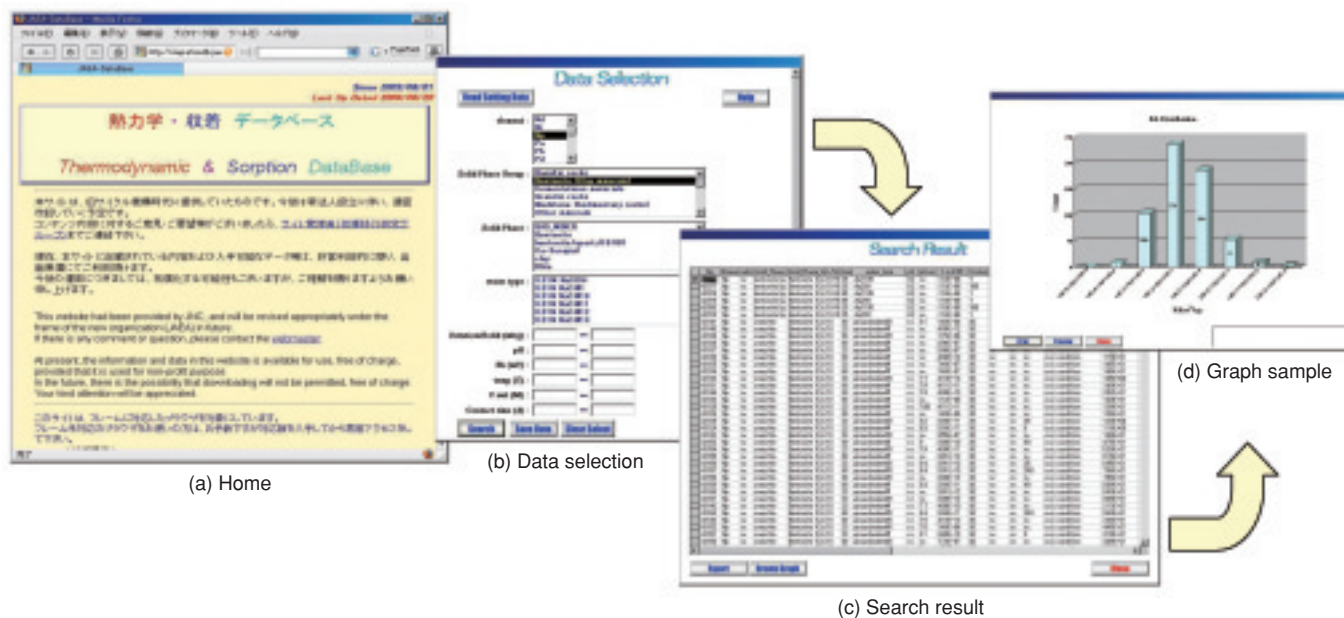


Fig.2-5 Example of database for radionuclide migration analysis - Distribution coefficient of Neptunium onto Bentonite

Safety assessment of high-level radioactive waste (HLW) disposal system in Japan is based on “groundwater scenarios”, where radionuclides are transported to the surface environment by flowing groundwater. For the estimation of transportation of radionuclides through buffer materials (clay minerals) and in the geosphere, it is necessary to develop basic data for solubility, sorption and diffusion of radionuclides. We have developed databases on radionuclide migration, which contain thermodynamic, sorption and diffusion databases (TDB, SDB and DDB, respectively), to provide solubility, distribution coefficient and diffusion coefficient of radionuclides. The TDB and the SDB have been released on the Web (<http://migrationdb.jaea.go.jp/>).¹⁾

The JNC-TDB for “Second Progress Report (H12)” contains solubility products and equilibrium constants, and enables determination of solubility of important radionuclides. The JNC-TDB also contains thermodynamic data on minerals, and thus it is also useful for investigating groundwater chemistry and long-term alteration behavior of buffer materials. The JNC-TDB and the TDB developed by an international TDB project are provided on the Web and available for use in geochemical calculation programs. Since

some thermodynamic data are less reliable, experimental and theoretical studies to evaluate the unreported and less reliable thermodynamic data are in progress by many institutions including JAEA. JAEA’s new TDB incorporating the latest information will be published around 2010.

The SDB contains the distribution coefficients (K_d) of elements onto clay minerals and rocks under particular experimental conditions. More than 20,000 K_d values have been put in the SDB. Using the SDB, we can search and graph the K_d distribution by selecting solid phases and/or groundwater chemistry and then can estimate unreported K_d . The latest K_d values are continuously put in the SDB, and the evaluation of the reliability of K_d values has started.

DDB contains the diffusion coefficient into typical clay minerals and rocks in Japan. The DDB has been published as a JAEA technical report and will be released on the Web in 2007.

The usefulness and easy accessibility of the data on radionuclide migration have been maintained by developing and publishing the databases continuously. Revision of the database based on the needs of the users will be continued to increase the number of users in the world.

Reference

- 1) Sasamoto, H., et al. Current Status of System Development to Provide Databases of Nuclides Migration. Japan Nuclear Cycle Development Institute, 2005, JNC Technical Review, no.28, JNC TN1340 2005-002, p.27-33 (in Japanese).