Open PhD position at KIT-INE, Karlsruhe, Germany

With more than 100 employees, the Institute for Nuclear Waste Disposal (http://www.ine.kit.edu/) at the Karlsruhe Institute of Technology (http://www.kit.edu) is the largest institute in the field of nuclear safety research within the Helmholtz Association of German Research Centers. Within the scope of provident research, KIT-INE conducts both basic and applied R&D in the field of safe disposal of nuclear waste. KIT-INE has a number of available facilities including:

- a radioactive controlled area for working with radionuclides of all types, where appropriate laboratories are equipped with state-of-the-art equipment, including hot cells, alpha and inert gas glove boxes,
- the most modern facilities and instrumentation for analysis of radioactive materials,
- state-of-the-art laser spectroscopy for speciation of radionuclides,
- the INE-Beamline for actinide research at the local synchrotron light source ANKA.

KIT-INE has currently an open PhD position on:

**Steel corrosion and actinides sorption by iron corrosion products under saline conditions**

Geological disposal is considered a prime solution to the safe management of high-level nuclear waste. However, during the geological evolution of the repository system, ground water may come in contact with the canister containing the nuclear waste and steel will start corroding. Information on steel corrosion under low saline conditions has been reported, but a detailed mechanistic understanding of steel corrosion under saline conditions, such as may be expected for a salt-based waste repository, is still lacking. The formation of secondary phases upon steel corrosion also constitutes an additional barrier to the radionuclide migration. However, only scarce information on radionuclide retention under saline conditions has been reported. The goal of this thesis is to obtain information on steel corrosion and on actinide retention by iron corrosion phases under saline conditions.

The first part of this PhD study will be dedicated to investigations on long-term steel corrosion under saline conditions and at elevated temperatures. The experiment will be designed and conducted, and at the end the neoformed corrosion products will be characterized by using various microscopic and spectroscopic techniques. Analysis of the data will provide a detailed mechanistic understanding of steel corrosion. The second part of the study will be devoted to the retention of actinides, under saline conditions, by secondary phases identified in the steel corrosion experiment. Information of the retention process at the molecular scale will be obtained from spectroscopic investigations, and thermodynamic data will be obtained by modelling of the macroscopic sorption data. Finally, experimental data will be complemented by quantum chemical calculations at the Density Functional Theory level for selected systems. The data generated within this study will be made available to improve safety performance assessment of a nuclear waste repository.

This PhD study is related to the KORSO project funded by the German Federal Ministry for Economic Affair and Energy (BMWi), dedicated to investigations on corrosion and sorption processes at steel surfaces at higher temperatures and pressures under saline conditions.


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*Note that this is no official job-offer from KIT, which will be posted later at the official KIT webpage.*