The effect of nanopores on U(VI) adsorption/desorption at mineral – solution interface

YUBING. SUN[1,2], HUIFANG XU[1]*, HUN-BOK JUNG[1], HIROMI KONISHI[1] TIANHU CHEN[2] AND ERIC.E. RODEN[1]

[1]University of Wisconsin-Madison, WI 53706, USA (*correspondence: hfxu@geology.wisc.edu)
[2]School of Natrual Resource and Environmental Engineering, Hefei University of Technology, Hefei 23009 China

Nanopores are ubiquitous in soils and clay-dominated sediments [1]. The effect of nanopore surfaces on U (VI) sorption / desorption and reduction is likely to be significant. Recent study of ethanol stimulated reduction of U (VI) associated with weathered shale saprolite sediments from Area 2 of the Oak Ridge Field Research Center (ORFRC) shows that about 40% of solid-associated U (VI) was not bioreducible [2]. Our batch adsorption and desorption experiments of nanoporous (alumina and synthetic goethite) and non-nanoporous (alpha-alumina and crushed natural goethite) materials were performed to demonstrate the effect of nanopore confinement. The U (VI) sorbed on nanopore surfaces is difficult to be desorbed in low concentration bicarbonate solutions. The sorbed U (VI) on nanopore surfaces may have strong chemical affinity. In natural sediments, the sorbed U (VI) in nanopores among alumino-silicate clays may account for the nonreducible U (VI).

[1] Wang *et al*. (2003) *Geology* **31**, 387–390. [2] Mohanty *et al*. (2008) *E S & T* **42**, 4384–4390.

Bioleaching of low grade uranium ore using a column reactor

SUN ZHANXUE[1,2], LIU YAJIE[1] AND LIU JINHUI[2]

[1]Key Laboratory of Nuclear Resources and Environment (East China Institute of Technology), Ministry of Education, Nanchang, Jiangxi 330013, China (*correspondence: zhxsun@ecit.edu.cn)
[2]Laboratory of National Defence Key Discipline of Radioactive Geology and Exploration Techniques (East China Institute of Technology), Fuzhou, Jiangxi 344000, China

Because there are not enough mid-high grade uranium resources in China to support the Chinese aggressive nuclear power development plan, new extraction techniques have to be developed for low grade U ores. The U bioleaching of low grade ores from the Qieryi U deposit, SE-China, was studied.

The U ore was ground to obtain a sample in the size range of 5-25mm. The average U grade was 0.012%. Uranium occurred mainly in pitchblende, thoriferous pitchblende, brannerite and coffinite. The mesophilic iron- and sulphur oxidizing bacteria *Acidibacillus ferrooxidans and Acidibacillus thiooxidans* isolated from acid mine drainage and waste rocks of the deposit were used in this work.

The experiment was carried out in a column reactor which was 1m high with an internal diameter of 0.15m. The ore was acidified using 15g/L H_2SO_4 solution until the pH of the leached solution is less than 2. After that, the column was fed with the bacteria solution using a peristaltic pump at the rate of 5% of the total ore weight per day. The experiment lasted 97 days. The acid usage is 7.6% and U recovery rate is 76.75%. The maximum U concentration of the leached solution is 42.9mg/L and the average is 14.5mg/L. The work indicated that bioleaching be the promising method for U extraction from low-grade ores or waste rocks in the deposit.

This work is supported by the China International Science and Technology Cooperation Project (2008DFA71760).