Uranium recovery from uranium ore with additional pyrite by column bioleaching

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The increasing use of uranium both in nuclear power industry and the generation of electricity has resulted in progressive exhaustion of high-grade uranium reserves worldwide. Bioleaching as a biological oxidation and complexation processe to mobilize metal cations from often almost insoluble ores, is mainly employed worldwidely in uranium. Pyrite is essential for uranium recovery especially in bioleaching[1]. Unfortunately, most uranium ores has low pyrite in China. In order to decrease cost of uranium extraction and improve uranium recovery, column bioleaching experiments were carried on with additional pyrite in the high fluoride-contained uranium ores.

The average grade of U of samples was 0.1789%, F was 3.36% in weight and -8mm sizes. Additional pyrite(wt%) contained 0.42 FeS_2 with size of -3mm. Dominant bacteria in culture for irrigation was *Acidithiobacillus ferrooxidans* and *Leptospirrilum ferrooxidans* was the minor ones. 3 columns as: minerals(40kg)+pyrite(3.0%(wt)) with culture, no pyrite and minerals(40kg)+pyrite(3.0%(wt)) with no culture, respectively.

After 103 days, uranium leaching rates by sludge were 93.77%, 89.93% and 78.17%, acid consumptions were 3.23%, 3.11% and 3.40% for the 3 columns, respectively. Culture compositions changed with the leaching processes greatly with the dominant bacteria of *At. thiooxidans* and *L. ferrooxidans* at the end of leaching.

It confirmed that the given uranium ores with high fluoride and low pyrite could be treated efficiently with the additional pyrite and the adaptive mixed culture.

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[1] Alexey Borisovich Umanskii & Anton Mihaylovich Klyushnikov. *J Radioanal Nucl Chem* (2013) **295** 151–156