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Removal, separation and removal of cesium, cobalt and strontium from the mixed solution using microbial cells

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Removal of cobalt, strontium and cesium ion from the aqueous solution containing the solution containing three kinds of metal ion using microorganism was examined. *Arthrobacter nicotianae* which had a high ability to remove cationic metal ion was used for the removal of these metal ions. The removals of cobalt, strontium and cesium using *Arthrobacter nicotianae* were affected by the solution pH, concentration of metal and cell amount. The amounts of metal ion removed were increased with increasing the pH (1-5) of the solution. Those (μmol metal ion/g dry wt. cells) were also increased with increasing the concentration of the metal ions, however, the amounts of total metal ion removed (%) were decreased. The amount of each metal removed (μmol metal ion/g dry wt. cells) from each metal ion was fitted with Langmuir isotherm. On the other hand, the amounts of total metal ion removed (%) were increased with increasing the cell amounts, however, the amounts of each metal ion removed (μmol metal ion/g dry wt. cells) were decreased. The removal of strontium using *Arthrobacter nicotianae* was very fast and almost reached equilibrium within 5 minutes. The amount of cobalt or strontium removed was higher than that of cesium removed by batch system. Therefore, the removal these metal ions was examined by column system. All the metal ions were removed by column system, next the separation of these metal ions adsorbed on immobilized microbial cells was desorbed using diluted nitric acid by stepwise concentration. All the adsorbed cesium was desorbed and most of them were separate from adsorbed strontium and cobalt. However, most of desorbed strontium and cobalt ions were not separated in this method. Additional separation method of these metal ions will also be discussed.

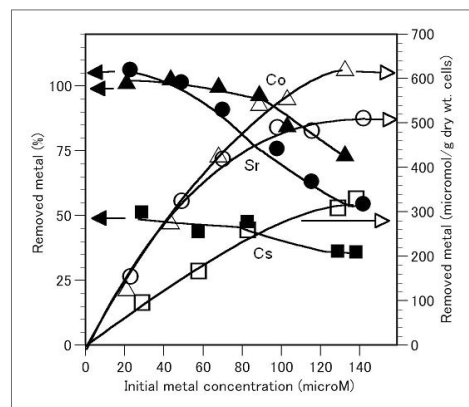


Figure-1: Effect of metal concentration on the removal of cobalt, strontium or cesium using *A. nicotianae* cells

Recent Publications

1. Tsuruta T (2002) Removal and recovery of uranyl ion using various microorganisms. *J. Biosci. Bioeng.*; 94: 23-28.

References

1. Andres Y, Maccordick H J and Hubert J C (1993) Adsorption of several actinide (Th, U) and lanthanide (La, Eu, Yb) ions by *Mycobacterium smegmatis*. *Appl. Microbiol. Biotechnol.*; 39: 413-417.
2. Strandberg G W, Shumate II S E and Parrott J R (1981) Microbial cells as biosorbents for heavy metals: Accumulation of uranium by *Saccharomyces cerevisiae* and *Pseudomonas aeruginosa*. *Appl. Env. Microbiol.*; 41: 237-245.
3. Byerley J J, Scharer J M and Charles A M (1987) Uranium (VI) biosorption from process solutions. *Chem. Eng. J.*; 36: B49-B59.
4. Friess N and Myers-Keith P (1986) Biosorption of uranium and lead by *Streptomyces longwoodensis*. *Biotechnol. Bioeng.*; 28: 21-28.

Biography

Takehiko Tsuruta has his expertise in removal, separation and recovery of toxic and useful metals from aqueous solution using microbial cells. He has started researching in this field in 1991 as an Assistant Professor of Miyazaki Medical College, Department of Chemistry. Later in 1998, he had joined Tohwa University, Department of Industrial Chemistry as an Associate Professor. Presently, he is working in the Department of Life and Environmental Sciences at Hachinohe Institute of Technology as a Professor.

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