Radiochemistry of Metals　　Prof. **Yoshinobu Shiokawa** (1996.5~)

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【Research Activities】

"Physics and Chemistry of Tranuranium" project begins the collaboration with Advanced Science Research, JAERI in 2003. The project is for fundamental investigation of neptunium compounds. Until now, the solid state properties of transuranium compounds have been studied at Institute for transuranium compounds and Los Alamos Scientific laboratory and the magnetization, specific heat and electric conduction have been elucidated.

On the other hand, our target is to clarify the Fermi surface of neptunium compounds, $NpTGa_5$ and the surface is found to be cylindrical conformation (**Ref.*1, 3, 4, 5***).

The amount of depleted uranium accompanied with production of enriched uranium is stored 1.2 x 10^7 tons, since the effective use of depleted uranium has not found. We have proposed uranium redox flow battery using cell active materials U^{3+} /U^{4+} and U_2^{+} / UO_2^{2+} Namely, in these redox couples, no ionic structure changes accompanied with redox reactions and therefore, electron transfers in these couples are rapid, because of no ionic structure changes. Therefore, the energy efficiency of the battery is expected to high, because it depends the rapidness of electrode reactions.

We have been investigated organic uranium complexs for the cell active materials and by the increase of the electron donating, the electromotive force is expected to be 1.0-1.4V, which is comparable with the practically used vanadium redox flow battery with electromotive force of 1.2 V (**Ref.*2***).

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J.Phys.Soc. Jpn., 73(2004)519-522.

2. T. Yamamura, K.Shirasaki, Y. Shiokawa, N.Nakamura, S.Y.Kim,
"Characterization of tetraketone ligands for materials of all-uranium redox flow battery",
J. Alloy. Compd. 374(2004)349-353.

3. D. Aoki, Y.Homma, Y.Shiokawa, E.Yamamoto, A.Nakamura, Y.Haga, R.Settai, T.Takeuchi and Y.Onuki,"
Single Crystal Growth, of Large-Size and High-Qaulity $NpCoGa_5$ and its Electrical and Magnetic Properties",
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4. D. Aoki, Y.Homma, Y.Shiokawa, E.Yamamoto, A.Nakamura, Y.Haga, R.Settai and Y.Onuki, "Two Kinds of Cylindrical Fermi Surface Determined by de Hass-van Alphen Experiments in $NpCoGa_5$", J.Phys.Soc. Jpn., 73(2004)1665-1668.

5. D.X.Li, S.Nimori, Y.Shiokawa, Y.Haga, T.D.Matsuda, S.Ikeda and Y.Oniki, "Superconductivity in $La_3Rh_2Ge_2$ and $La_3Pt_2Ge_2$", IEEE Trans.Appl. Supercond. 14(2004)1137-1140.

- High-quality single crystal growrth of NpX_3, $NpTGa_5$, NpO_2 and Np-based skutterudite compounds
- Search for anisotropic superconductivity in Np compounds
- Fermi surface study of transuniraum compounds including Np and Pu
- Study of anisotropic superconductivity in $PuRhGa_5$
- Study of mulipole ordering in NpO_2
- NMR measurements of Np compounds
- Mossbauer spectroscopy of Np compounds
- Development of cell active materials with rapid electrode reactions.
- Electrochemical study of uranium complexes
- Development of uranium redox flow battery
- Preparation of electropositive metals by hydrometallurgy
- Treatment of redioactive waste