

High temperature thermophysical properties of the materials related nuclear fuel cycle

Reduction of radioactive wasteland long life nuclide by novel nuclear system

## 1. Outline of Research Areas

To develop a safety nuclear power plant from the view of the material science, materials for nuclear fuel, clads, control rods and reprocessing processes have been studied. Especially, the measurement of thermophysical properties of materials at high temperatures are promoted.

## 2. Research Topics

### ●Development of the alloy fuels for transmutation of the minor actinides (MA).

The radioactive waste which occurs from a fuel cycle can be reduced by burning minor actinides (Am, Cm, Np, etc.) they have with long half-lives, with a fast reactor. However, since radioactivity of MA is high, handling is difficult for it. Although utilization is aimed at by making it the alloy fuel which is easy to manufacture, neither the state of a melted metal nor the situation when it solidifies is known well. By clarifying such a fundamental high temperature property, the phase diagram (Fig. 1) used as the map of material development is improved.

Multi-component phase diagram is very precious data.

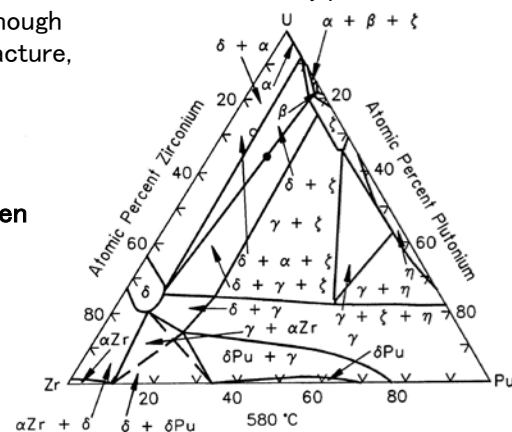


Fig.1 U-Pu-Zr phase diagram

### ●Molten-salt properties for pyroprocess fuel reprocessing and molten salt reactors

To develop the pyroprocess for FBR cycle and molten salt reactors, thermodynamic data (vapor pressure, activity, volatile species) for many melted salts are measured by using a mass spectrometer.

### ●Molten salts Reactor.

To evaluate the thermo-physical properties of molten salt used for MSR (Molten Salt Reactors), vapor pressures of molten salts by using Q-mass.



Fig.2 Casted U-Zr-RE alloys

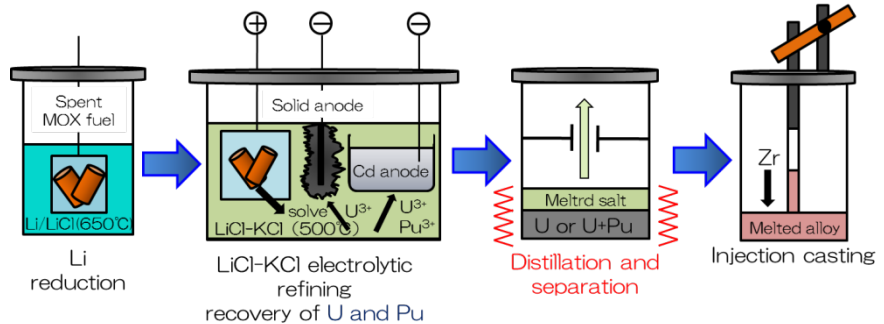


Fig.3 Pyroprocess for metallic fuel

## Vision of nuclear power and nuclear energy

Reservation of safety for the fuel and the fuel cycle technology. (stability, waste reduction, etc.)

Thermophysical properties measurements and developments of the apparatus for it.

Based on basic physical-properties evaluation, nuclear safety and advanced nuclear technology will be developed.

## Message to students

Since it inquires using various experimental devices, you can master various equipment skills. It is also emphasized at the simulation using a computer.