

## A Study on Dispersion Type (U-10wt%Zr)-50wt%Zr Fuels (분산형 (U-10wt%Zr)-50wt%Zr 연료에 관한 연구)

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### 1. Introduction

Either TRU(transuranic)-Zr metal alloy or (TRU-10wt.%Zr)-Zr dispersion fuel is considered as a blanket fuel for HYPER (Hybrid Powder Extraction Reactor). In the case of dispersion fuel, particles of TRU-10wt.%Zr metal alloy are dispersed in a Zr matrix.

A computer code DIMAC is under development for the dispersion fuel design. In order to increase the accuracy of DIMAC, material properties and fuel performance data are required. But few data are available for the HYPER system fuel in which Zr fraction is higher than 40wt%. Since TRU is not available in Korea, a simulated (U-Zr)-Zr fuel using uranium instead of TRU was fabricated and tested to produce the required basic material data for the dispersion fuel.

### 2. Experimental procedure

U-10wt%Zr particles were fabricated by a centrifugal atomization process in an argon environment. The density of the fuel powder was measured as a function of particle size by Archimedeian immersion method. The morphology and microstructure of the powder were characterized with an SEM.

The atomized U-10wt%Zr powder and Zr powder were mixed, cold-pressed, and then hot-extruded to a cylindrical rod at 1123K. The microstructure of (U-10wt%Zr)-50wt.%Zr fuel was also investigated.

### 3. Result and discussion

Most of the atomized U-10wt%Zr alloy powders have a smooth surface and a near-perfect spherical shape with few attached satellites. The atomized powder are found to be comprised of  $\alpha$ -U and  $\delta$ -UZr<sub>2</sub> phases with fine and homogeneous structure, and as powder size decreases, the phases structures became much finer due to the enhanced cooling rate. The density of atomized U-10wt%Zr powder decreases slightly as the particle size increases. This is due to the increased fraction of internal pores. During the extrusion, the dispersed U-10wt.%Zr particles were broken due to the harder Zr matrix.