

In-Reactor Behaviour of Centrifugally Atomized U₃Si Dispersion Fuel Irradiated at High Temperature in HANARO

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Abstract

The irradiation test on full-size U₃Si dispersion fuel elements, prepared by centrifugal atomization and conventional comminution method, has been performed up to about 77 at.% U-235 in maximum burn-up at CT hole position having the highest power condition in the HANARO reactor, in order to examine the irradiation performance of the atomized U₃Si for the driver fuels of HANARO. The in-reactor interaction of the atomized U₃Si dispersion fuel meats is generally assumed to be acceptable with the range of 5~15 μm in average thickness. The atomized spherical particles have more uniform and thinner reaction layer than the comminuted irregular particles. The U₃Si particles have relatively fine and uniform size distribution of fission gas bubbles, irrespective of the powdering method. The bubble population in the atomized particles appears to be finer and more homogeneous with the characteristics of narrower bubble size distribution than that of the comminuted fuel. The atomized U₃Si dispersion fuel elements exhibit sound swelling behaviours of 5 % in $\Delta V/V_m$ even at ~77 at.% U-235 burn-up, which meets with the safety criterion of the fuel rod, 20vol.% for HANARO. The atomized U₃Si dispersion fuel elements show smaller swelling than the comminuted fuel elements.