Fabrication of Large U-Mo Particle Powder by Centrifugal Atomization Process to Overcome Interaction Problem in Research Reactor Dispersion Fuel

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Abstract

In order to replace high enriched uranium fuel with low enriched uranium fuel in research reactors in connection with nuclear non-proliferation policy, U-Mo dispersed Al matrix fuel is under development due to high uranium density and gamma meta-stable properties of U-Mo alloy. U-Mo particle size of smaller than average 60 μm in irradiation in-reactor test showed that the interaction of U-Mo particle with Al matrix was almost completed without remaining Al matrix. Much swelling from lower density product formation occurred in all area. The interaction rate increases with temperature. In addition the depletion of aluminum matrix having good thermal conductivity induced central temperature to rise up very high. The fuel degradation was revealed to be inevitable. In order to overcome much larger U-Mo particle size has been implemented in U-Mo dispersion research reactor fuel. As U-Mo particle size in dispersion fuel is larger, the inter-particle space and specific interface area get longer and smaller, respectively. Consequently the temperature rising rate could be retarded and the central area of fuel could maintain at the relatively low temperature. It is expected that larger U-Mo particle dispersion fuel will show a good fuel performance. In KAERI a centrifugal atomizing process had been developed for producing U_3Si powder for HANARO fuel previously. An investigation on fabrication of large U-Mo particle powder by centrifugal atomization has been carried out. The atomizing parameters such as disk rotating speed and diameter and cooling gas were adjusted. The preliminarily fabricated U-Mo powder was observed to have up to 1000 ㎛ in diameter with relatively narrow size distribution. The particle shape of large particle powder maintained as spherical. X-ray diffraction analysis represented gamma phase due to still high cooling rate.

Methyl Conformation and Spectroscopy in Some Halide and Methyl-substituted Aromatic Products

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Abstract

This work reports the results of a comparative study of the molecular geometry of some aromatic halogeno-methyl as calculated using quantum mechanics and as inferred from experimental data (X-Ray and Neutron Diffraction). This is part of a work dealing with the not-yet understood poly-substitution of these products with halides (I, Br, Cl) to determine accurately the correlation between the dynamic properties of methyl as a quantum rotor and the variation of methyl protons localisation as a function of the perturbation caused by the rotor potential. The methyl group is perhaps the simplest example of a high-amplitude movement of light atoms governed by non-covalent forces. Our interest in this work is to establish the interaction between this quantum rotor and the skeleton to which it is bound.

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