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The influence of porosity on thermal conductivity of low-density uranium oxide.

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In uranium-plutonium mixed oxide (MOX) fuel fabrication, the mitigation of specifications on fuel design is considered from a viewpoint of improvement of economic efficiency. The pellet density of the MOX fuel for fast reactors is one of the important specifications in the fuel design and it fluctuates with changes in the properties of raw material powders. As the one of the mitigations of specifications, the tolerance expansion of the density specification is considered. In this consideration, it is necessary to confirm the applicability of the porosity correction equation to the thermal conductivity in a low density region. The relation among a porosity (p), a density (d) and a theoretical density (d_{th}) is described as follows: $p=1-(d/d_{th})$.

In this study, UO₂ pellet was adopted as test specimen for the following reasons. The same porosity correction equation can be applied to the thermal conductivities of UO₂ and MOX. The stability of the oxygen to metal (O/M) ratio of UO₂ pellets in the thermal conductivity measurement is superior to that of MOX pellets. The specimens were prepared by a conventional powder metallurgy process and the densities of the specimens were adjusted in the wide range by using crystalline cellulose. The thermal conductivities of these specimens were measured and the applicability of the porosity correction equation to the thermal conductivity in a low density region was evaluated.

Country/Int. Organization

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