지르칼로이-4 의 고온 수증기 산화에서 압력효과

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ABSTRACT

In the severe accident case like LOCA, Zircaloy(Zry) claddings are oxidized not only in high temperature but also in high pressures. It is a concern whether the safety of high burn up fuels can be maintained during severe accident. The effects of steam pressure on Zry-4 oxidation, and the effect of pre-existing oxide layer on the cladding in the high temperature-high pressure oxidation of Ziy-4 were investigated. The experimental temperature range was 700~900°C, and the pressures were between 0.1 and 15.0MPa. Partial pressure of steam turned out to be the important one rather than total gas pressure. The higher the steam pressure was applied, the thicker the oxide became. The effect of steam pressure on the oxidation of claddings with pre-existing oxide was about 40~60% less effective than that of pickled cladding. Accelerated oxidation in high-pressure steam seems to be originated from the formation of microcracks produced during the transformation of tetragonal zirconia to monoclinic phase. Steam pressure seems to affect the stability of tetragonal phase.