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THE EFFECT OF RESIDUAL STRESS ON GROWTH OF OXIDE SCALE ON ZIRCONIUM ALLOYS

Abstract:

Zirconium alloys have been extensively used in nuclear power reactors as cladding materials and structural fuel assembly components because of their low neutron absorption, adequate mechanical properties and corrosion resistance. However, corrosion of the cladding can be a life-limiting factor and a better understanding of the corrosion mechanisms could lead to improvement of the burn up efficiency. Residual stresses that develop in the oxide, due to the large difference of the molar volumes of zirconium and zirconium dioxide, are believed to play a key role in understanding the corrosion mechanism. In this work high-energy synchrotron X-ray diffraction, in transmission geometry, has been employed for residual stress measurement in zirconium oxides. Results from complementary finite element analysis have been related to the experimental results.