

X-Ray Photoelectron Spectroscopy Analyses of Candidate Materials for Advanced Nuclear Reactors

Authors : Marie Kudrnová, Jana Rejková

Abstract : The samples of supplied INCONEL 601, 617, 625, and HASTELLOY C-22 alloys and experimental nickel alloy MoNiCr were examined by XPS (X-ray photoelectron spectroscopy) before and after exposure. The experiment was performed in a mixture of LiCl-KCl salt (58.2-41.8 wt. %). The exposure conditions were 440°C, pressure 0.2 MPa, 500 hours in an inert argon atmosphere. The XPS analysis shows that a thin oxide layer composed of metal oxides such as NiO, Cr₂O₃, and Nb₂O₅ was formed. After sputtering the exposed surface with Ar ions, metals were also detected in the elemental state, indicating a very thin protective oxide layer with a thickness in units of up to tens of nanometers.

Keywords : XPS, MSR, nickel alloy, metal oxides

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