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High-temperature Oxidation Resistance of Chromium-based Coatings Deposited by DLI-MOCVD for Enhanced Protection of the Inner Surface of Long Tubes

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Abstract

For nuclear safety issues, there is an international effort to develop innovative "Enhanced Accident Tolerant Fuels" (EATF) materials. EATF cladding tubes are of particular interest because they constitute the first barrier against radioactive fission species dispersal in case of accidental scenario such as LOCA (LOss of Coolant Accident). Actual nuclear fuel claddings are made from Zr-based alloys and to increase safety margins, both mechanical strength and resistance to high-temperature oxidation have to be improved. Several alternatives using high-temperature oxidation resistant coatings for outer-wall protection have been proposed worldwide but there is currently no solution for the inner-wall protection. In order to resist to high temperature steam environment upon LOCA transients, internal Cr-based coatings deposited by DLI-MOCVD (Direct Liquid Injection of MetalOrganic precursors) were investigated. These hard metallurgical coatings could also be used in high-temperature corrosive environments as those encountered in aeronautics and other industries to protect 3D