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High temperature nanoindentation hardness and Young's modulus measurement in a neutron-irradiated fuel cladding material

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Abstract

Nanoindentation, in combination with scanning probe microscopy, has been used to measure the hardness and Young's modulus in the hydride and matrix of a high burn-up neutron-irradiated Zircaloy-2 cladding material in the temperature range 25–300 °C. The matrix hardness was found to decrease only slightly with increasing temperature while the hydride hardness was essentially constant within the temperature range. Young's modulus decreased with increasing temperature for both the hydride and the matrix of the high burn-up fuel cladding material. The hydride Young's modulus and hardness were higher than those of the matrix in the temperature range.