Society of Engineering Science 51st Annual Technical Meeting

1–3 October 2014

Purdue University, West Lafayette, Indiana, USA

Stability of the two-phase microstructure of shocked zirconium

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ABSTRACT

The microstructure of two-phase () shocked zirconium was studied in-situ during heating□□□ with high energy X-ray diffraction techniques. The volume fraction of the phase was monitored as the reverse phase transformation occurred:□□metastable the start and finish temperatures being 470 K and 550 K, respectively, during heating at 3 K/min. Phase strains were monitored and separated in terms of thermal expansion and mechanical strains due to local phase constraints. Stresses in the □ zirconium were estimated to be a superposition of a hydrostatic component (of order –50 MPa) and uniaxial component (of order –600 MPa) along the *c*-axis. A high dislocation density was observed in both the phases in the as-shocked state. The dislocation□□ and□ phase□density of the decreased preceding the reverse transformation suggesting that it is the presence of the high concentration of defects in the phase which retarded the□ *p*□reverse transformation to the stable hase.