X-RAY STRESS ANALYSIS OF DAMAGE EVOLUTION IN Ti-SiC UNIDIRECTIONAL FIBER COMPOSITES

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Standard X-ray stress analysis of polycrystalline materials assumes the measured strains are representative of the irradiated volume. As the beam size approaches the size of the diffracting grains, this assumption no longer remains. The resulting strains may not represent the local average of the diffracting medium. They become influenced by grain-specific stresses; assuming diffracting grains are even present due to the "graininess" problem. In order to overcome these issues, area detectors were employed to capture the entire Debye ring. Lattice spacings were then observed as an average over all possible orientations for the diffracting plane. The technique was applied to a Ti-matrix/SiC-fiber composite. Using high energy X-rays and a beam size less than a fiber cross-section, the damage zone around a broken fiber was investigated. The elastic strain evolution of this zone was monitored *in situ* under applied tensile stress. Where traditional X-ray stress analysis can provide the fiber strains, the matrix grain size required the use of the area detector. The results will also be compared to the predictions of some micromechanics models.

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