

INVESTIGATION OF FIBER/MATRIX INTERFACES USING X-RAY MICROTOPOGRAPHY

Jay C. Hanan¹, Ersan Üstündag¹, C. Can Aydiner¹, Geoffrey A. Swift¹
Steffen K. Kaldor² and I. Cevdet Noyan²

¹ Department of Materials Science, California Institute of Technology, Pasadena, CA 91125,
USA

² IBM Research Division, T.J. Watson Research Center, Yorktown Heights, NY 10598, USA

The structure and strength of fiber/matrix interfaces in fiber-reinforced composites are crucial parameters in determining the overall mechanical behavior of these materials. To investigate the integrity and structure of such an interface on the microstructure scale, a model composite consisting of a single-crystal Al₂O₃ fiber in an Al matrix was investigated with X-ray microdiffraction. The intensity of the (300) reflection of Al₂O₃ was monitored in topography mode using an X-ray beam focused by a tapered capillary. Significant changes in this intensity revealed buried voids along a nominally intact interface. These changes also provided information about the distribution of shear stresses along the interface. The results were compared with model predictions, for example, using the shear-lag concept.