

CRACKING DETECTION OF A UNIDIRECTIONALLY-REINFORCED SiC/SiC COMPOSITE BY X-RAY TALBOT-LAU INTERFEROMETRY

Masaki Kotani, Japan Aerospace Exploration Agency, Japan
kotani.masaki@jaxa.jp

Yoshihisa Tanaka, Tokyo University of Technology, Japan

Hiroshi Hatta, Tokyo University of Technology, Japan

Yutaka Kagawa, Tokyo University of Technology, Japan

Key Words: X-ray Talbot-Lau interferometry; matrix crack; multiple fracture.

An X-ray imaging system based on Talbot-Lau interferometry with specially designed materials testing system has been developed and its usability for direct monitoring of damage evolution process in SiC/SiC composite has been studied. Unidirectional mini-composite was tensile-tested where the specimen was repeatedly loaded and unloaded with maximum load was increased step-by-step, and the system was applied for taking its images when it was tensed at the maximum loads and when relieved afterwards. Unique X-ray images such as differential phase and small angle scattering images were obtained. By comparing them with conventional X-ray CT image, the advantage of the X-ray Talbot-Lau interferometry was assessed in terms of low magnification crack detection done in very short time (ca. 10 sec.). The images of fig. 1 clearly demonstrated that the interferometry can detect the damage evolution of a composite which is comprised of matrix multiple fractures. Damages could be practically identified even after being unloaded, whereas those became almost invisible due to closure of cracks. Crack density could be measured quantitatively and could be applied for the analysis of fracture mechanism of the composite. These all results showed high potential of the system for future application as the NDI for SiC/SiC composite.

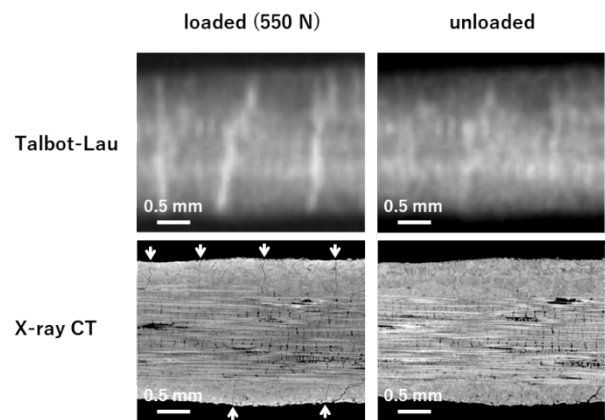


Figure 1 – Images of damaged composite