SICE Journal of Control, Measurement, and System Integration, Vol. 3, No. 4, pp. 279–284, July 2010

Detection of Ceramic Cracks Using a Distributed High-Resolution Brillouin Fiber Optic Sensor

Maria Feng *, Lufan Zou **, and Michio Imai *

Abstract : A distributed sensor system is highly desirable for detecting, locating, and monitoring fine cracks at unknown locations in advanced ceramics. This paper presents a distributed high-resolution fiber optic sensor based on the Brillouin scattering principle, and its application in ceramic crack detection for the first time. The existence of cracks, together with their locations, is identified by measuring the strain distribution on a sensing fiber bonded to the ceramic surface. By employing the innovative coherent probe-pump interaction technique, the Brillouin sensor developed in this study achieves a high spatial resolution (100 mm) and measurement accuracy. Capable of detecting and locating fine cracks less than 40 μm, the efficacy of the distributed Brillouin fiber optic sensor is demonstrated through experiments.

Key Words : Brillouin scattering, crack detection, strain measurement, fiber optic sensor, advanced ceramics.