

Measurement of J Intergral by Shadow Spot Generated from Out-of-plane
Displacement

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Abstract

The out-of-plane displacement field at the crack tip region of a compact tension specimen is measured by a stereo vision and used to generate a shadow spot on the virtual screen placed behind the specimen by using the mapping equation of reflected caustics. The J values are then computed using the maximum transverse diameter of the generated shadow spot. In the experiment the in-plane displacement data are also recorded to obtain J measurements along contours surrounding the crack tip. Results indicate that for crack extension up to 0.275 mm, the J values evaluated using the generated shadow spot are in good agreement with the measurements from the inplane displacement data and the MerkleCorten formula. However, the J values obtained using in-plane displacement data are still close to the Merkle-Corten results even when the crack growth of $\Delta a = 4.0$ mm is reached.

Keyword : Stereo vision, compact tension specimen, out-of-plane displacement, caustics, stress intensity factor, J integral