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Acoustic Emission Technique, a Nondestructive Monitoring Tool for Damage Detection and Evaluation

Tawhidul Islam Khan

Department of Mechanical Engineering, Faculty of Science and Engineering, Saga University, Saga 840-8502,
JAPAN

ABSTRACT

Acoustic emission (AE) signals that are generated due to the sudden rearrangements of stresses inside a material as elastic waves, are widely used in non-destructive testing (NDT) of material cracking especially in health monitoring of structures for damage detection as well as in plant maintenance etc. When a body is subjected to an external stimulus (in the form of changing pressure, load, or temperature), any micro fracture inside the body releases energy in the form of AE wave which is received by AE sensor, later on, is converted to electrical signals termed as AE signals for internal inspection. This evaluation technique is termed as acoustic emission technique. In early stage, major importance was given on studying the AE characteristics during the deformation and fracture on various materials (by J. Kaiser in Germany in 1950, by B. H. Schofield in the U. S. in 1954). However, as the time passed, lots of researches have been conducted in different fields about behavioral formulation, theoretical explanation as well as experimental validation of this technique in AE signal generation, propagation and inspection with various kinds of deformations as an important health monitoring tool for NDT. In the present topic, features outlook of AE based nondestructive monitoring technique perspective to the damage detection and evaluation are planned to be elaborated. Basic theories, experiments related to the material cracking behavior are included to the presentation. Source localization of internal damage that has become an important characteristic feature in AE technique based NDT is also planned to be elaborated to this presentation. Furthermore, AE technique perspective to the advanced applications are also summarized in the present topic. Several practical research results are planned to discuss in the proposed presentation as well.

Keywords: Acoustic emission, non-destructive testing, structural health monitoring.