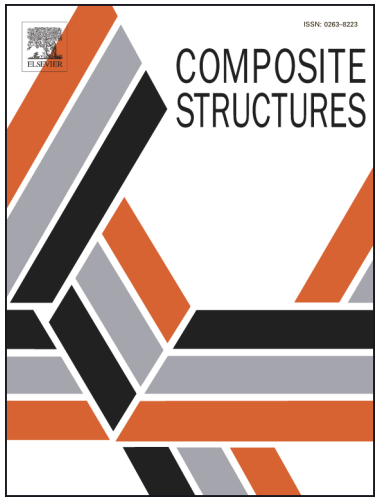

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Damage-induced Acoustic Emission Source Identification in an Advanced Sandwich Composite Structure

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Abstract

This paper proposes an acoustic emission (AE) based real-time health monitoring framework to efficiently identify the probable damage initiation/propagation locations in advanced sandwich composite structures. Towards this, numerical simulations and laboratory experiments on damage-induced AE-wave propagation in an aramid honeycomb composite structure have been carried out using a randomly selected sensory network. The simulation results are successfully validated with laboratory experiments. Eventually, the damage-source/AE-source regions are efficiently identified by applying an evolutionary algorithm- *Particle-Swarm-Optimization* based monitoring framework, which uses the registered AE-signals from the sensory network. A thorough assessment of different AE-source locations was carried out to evaluate the performance and the robustness of the proposed online monitoring strategy. The results clearly represent the efficiency of the framework for localizing the AE-source locations in such advanced and complex structures. Moreover, the proposed framework is reliable, independent of sensor positions, and not dependent upon the operator's expertise.

Keywords: acoustic emission; aramid honeycomb composite sandwich panel; piezoelectric transducer disc sensors; damage localization; particle swarm optimization; structural health monitoring.