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C. Yeum, H. Sonh, J.-B. Ihn

Lamb Wave Decomposition Using Amplitude Matching with Concentric Circular PZT Transducers

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Lamb waves using surface-bonded piezoelectric transducers (PZTs) have been widely applied to Non Destructive Evaluation (NDE). However, the identification of individual Lamb wave modes and the subsequent data interpretation are often difficult due to the dispersive and multimodal natures of Lamb waves. To tackle this problem, several techniques to isolate a specific Lamb wave mode of interest have been proposed previously. They include (1) a technique that requires placement of collocated PZT transducers on both surfaces of a specimen, (2) one based on the tuning of the driving frequency with respect to the PZT size and the plate thickness, and (3) an array of PZT transducers with time delays, to name a few. In this study, a Lamb wave decomposition technique using newly designed concentric circular PZT transducers attached on a single side of a plate is proposed. The advantages of this approach compared to the previous approaches are that (1) PZT transducers need to be placed only a single surface of a specimen and (2) mode decomposition can be performed at any desired frequency band. The proposed mode decomposition technique is formulated by solving 3D Lamb wave propagation equations considering the PZT size and shape effects. The effectiveness of the proposed method is investigated through numerical simulations, and experimental tests performed on an aluminum plate.

Ключевые слова:

Содержание.

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