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Influence of Environment Condition on the Group Velocity of the Lamb Wave for SHM System

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We have been developing a Structural Health Monitoring (SHM) system. One of the monitoring targets of the system is the debonding in the bond-line of Carbon Fiber Reinforced Plastic (CFRP) adhesive structures. In the SHM system, Fiber Bragg Grating (FBG) optical fiber sensors are used to detect Lamb waves and piezoelectric (PZT) transducers are used to generate Lamb waves. When debonding occurs in the bond-line of CFRP adhesive structures, the transmission route length of the Lamb waves increases, and the time taken for the Lamb wave to reach the FBG sensors increases. The SHM system measures the Lamb waves and calculates the debonding length from the increase of the transmission time. Therefore, in the case of debonding monitoring the precise group velocity of a specific Lamb wave mode is required to achieve an accurate evaluation of the debonding length. However, it is well known that the group velocities of the Lamb waves are affected by environmental conditions such as temperature and strain. Thus, it is necessary to investigate the influence of strain and temperature on the velocity of the A0 mode in the Lamb waves and to develop a technique to compensate the influences of environmental conditions.

In this study, we investigated the influences of temperature and strain on Lamb waves. Moreover, we developed prototype integrated tape-type FBG sensors to measure ambient temperature, and we evaluated the temperature detection performance of the sensor.

Ключевые слова:

Содержание.

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