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Higher Order Acoustoelastic Lamb Wave Propagation in Stressed Plates

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Residual stresses can be generated during fabrication processes, such as, welding, forging, rolling etc[1-3] . They have obvious influence on the performance of the material, like cracking and corrosion. To better control residual stresses, the initial distribution of them in materials must be clear. Ultrasonic methods can be used as a good tool for residual stress detection, and this approach is non-destructive and costs are modest. Methods which utilize longitudinal critically refracted (LCR) waves are receiving increased attention and it can be used on thick material. However, there have only been a limited number of studies which consider the acoustoelastic effect for thin plate materials which generate Lamb waves[4] . This paper reports a study in which a numerical model[5-6] is used to investigate the Lamb wave dispersion curves under loading that induce stresses. The effects of stress on various Lamb modes are discussed and those which appear to be most sensitive are identified. It is found that when the stress's direction is the same with wave propagation direction in a 1 mm thick aluminum plate the A0 mode is the most sensitive to the applied stress.

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