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The Influence of Pearlite Volume Fraction on Rayleigh Wave Propagation in A572 Grade 50 Steel

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The acoustoelastic effect is the interaction between ultrasonic wave velocity and stress. To estimate the stress a perturbation signal is introduced and the shift in time of flight is measured at the receiving location. In addition to the stress, the wave velocity can be affected by the amount of phases in the material's microstructure. This study investigates the changes in Rayleigh wave velocity for A572 grade 50 steel as a function of stress and pearlite phase volume fraction. In order to obtain different amounts of pearlite the samples are heat treated at 970 °C for time durations of 30 min, 1 hour, 2 hours and 4 hours and then furnace cooled. The acoustoelastic coefficient for 0.5 and 1 MHz perturbation frequency is calculated by uniaxial loading of each heat treated plate while measuring ultrasonic wave velocity. The results are compared for pearlite phase volume fraction obtained from optical microscopy and hardness measurements.