

Nondestructive Evaluation of Composite Rods Using Ultrasonic Wave Propagation

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Nondestructive Evaluation (NDE) is a branch of applied science that is concerned with assessing the properties and serviceability of materials and structures without causing collateral damage or depreciation. This study presents a detailed analysis of advanced composite rods (comprised of two or more distinct axial sections of different materials) using theoretical ultrasonic NDE. In anticipation of the high elastic moduli of the rods (relative to many metals) along their longitudinal axes, a one-dimensional wave propagation analysis will be conducted. By analyzing the propagation of ultrasonic waves in non-dispersive media and the corresponding reflections and transmissions at structural interfaces, assessments of interfacial de-bonding will be explored and the presence of anomalous materials can be demonstrated. The resulting graphical presentations will be compiled and should provide the basis for easy material characterizations and assessments of structural integrity throughout the rods.

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