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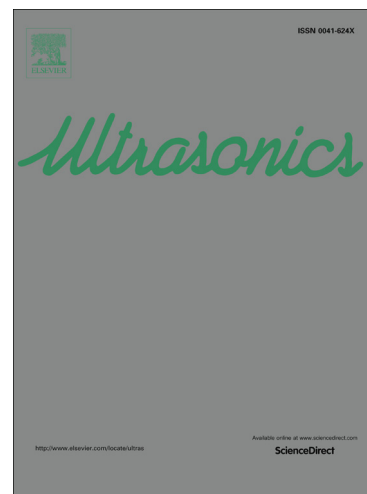
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Review of air-coupled ultrasonic materials characterization

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Abstract

This article presents a review of air-coupled ultrasonics employed in the characterization or nondestructive inspection of industrial materials. Developments in air-coupled transduction and electronics are briefly treated, although the emphasis here is on methods of characterization and inspection, and in overcoming limitations inherent in the use of such a tenuous sound coupling medium as air. The role of Lamb waves in plate characterization is covered, including the use of air-coupled acoustic beams to measure the elastic and/or viscoelastic properties of a material. Air-coupled acoustic detection, when other methods are employed to generate high-amplitude sound beams is also reviewed. Applications to civil engineering, acoustic tomography, and the characterization of both paper and wood are dealt with here. A brief summary of developments in air-coupled acoustic arrays and the application of air-coupled methods in nonlinear ultrasonics complete the review. In particular, the work of Professor Bernard Hosten and his collaborators at Bordeaux is carefully examined.

Keywords: air-coupled ultrasonics, air-coupled transducers, materials characterization, nondestructive evaluation

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