FSM1S_12555

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Numerical Analysis of the Texture and Acousto-Elastic Properties of Prestressed Polycrytalline Aggregate

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The propagation of ultrasonic waves is considered in a polycrystalline aggregate (e. g., steel) made of crystallites of the highest cubic symmetry, the waves being plane and linearly polarized. The crystallite orientation distribution is assumed to imply the orthorhombic symmetry of the macroscopic (effective) acoustoelastic properties of the body. Moreover, the sample is assumed to be subjected to plane increasing stress (up to 750 MPa), the principal directions of the stress as well as the directions of wave propagation and polarization are assumed to be coincident with the orthorhombic symmetry axes. The Voigt's averaging procedure and Jaynes' principle of maximum Shannon entropy of the probability density functions of the single crystallite orientation and the equations governing the wave propagation in prestressed polycrystal are accepted as a reliable basis for the evaluation of the influence of the changes in stress on both the effective acoustoelastic properties of the polycrystalline aggregate and the probability density function of the crystallite orientations (texture). In this way an algorithm is prepared which allowed us to evaluate numerically these effects.

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