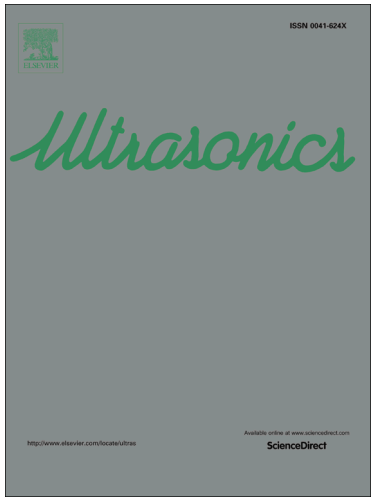

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Abstract: A photoacoustic, laser ultrasonics based approach in an Impulsive Stimulated Scattering (ISS) implementation was used to investigate the texture in polycrystalline metal plates. The angular dependence of the 'polycrystalline' surface acoustic wave (SAW) velocity measured along regions containing many grains was experimentally determined and compared with simulated results that were based on the angular dependence of the 'single grain' SAW velocity within single grains and the grain orientation distribution. The polycrystalline SAW velocities turn out to vary with texture. The SAW velocities and their angular variations for {110} texture were found to be larger than that the ones for {111} texture or the strong γ fiber texture. The SAW velocities for {001} texture were larger than for {111} texture, but with almost the same angular dependence. The results infer the feasibility to apply angular SAW angular dispersion measurements by laser ultrasonics for on-line texture monitoring.

Keywords: laser ultrasonics, texture, surface acoustic waves

1. Introduction

The properties of polycrystalline materials are determined by the combination of the crystalline properties of the individual grain 'crystallites', the number, size and shape of grain boundaries, and the orientational distribution of the crystallites. Only in rare cases, the orientation of the crystallites in a polycrystal is randomy distributed so that the material behaves macroscopically isotropic. In most cases, the orientational distribution is anisotropic, and characterized by a 'texture' with a preferred orientation, resulting in angular dependence in many of the macroscopic physical (electrical, optical, and mechanical[1-3]) properties[1]. Numerous fabrication processes to control the texture are being developed. The determination and interpretation of textures are therefore of fundamental importance in materials science and technology[2], especially since materials are pushed ever closer to their working limits. Small changes to the grain structure or orientation can have a large effect on the performance of the material.