conferenceseries.com

Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C6-030

3rd International Conference on
Magnetism and Magnetic Materials
October 22-23, 2018 | Rome, Italy

Direct volumetric measurement of crystallographic texture using acoustic waves

Bo Lan
Imperial College London, UK

Crystallographic texture (i.e. preferred orientation distribution) in polycrystals has profound effects on a range of physical properties (e.g. elasticity, plasticity, magnetism and thermal expansion hence is of great industrial importance. However, cost-effective, lab-based, non-destructive measurement of bulk texture has been elusive for the existing texture measurement techniques, such as EBSD, X-ray or neutron diffraction. This talk gives an overview of the efforts towards enabling such capabilities using ultrasound. These developments are based on a general theoretical platform developed by the speaker, which demonstrates that the 3D wave speeds in a polycrystals could be approximated as a simple spherical convolution between texture and single crystal speeds, thus enabling generic inverse texture extraction. Two independent experimental implementations of the theories have been achieved: one is based on the conventional water-bath ultrasonic system, where the directional variations of polycrystals wave speeds are directly measured, to be input to the de-convolution model for texture; and the other employs the resonant ultrasound spectroscopy to measure elastic constants from a regular-shaped sample's natural frequencies, and the wave speeds are calculated from the measured elasticity. Both techniques have been used to examine a range of industrial metals, including titanium, zirconium, and stainless steels, with the results successfully verified against the well-established neutron diffraction. Utilization of such texture information, e.g. to predict macroscopic properties, is also explored.

bo.lan@imperial.ac.uk