

INVESTIGATION OF DISLOCATION DENSITY IN ALUMINUM ALLOYS BY VARIOUS TECHNIQUES

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Abstract: Dislocations play very important role in the plastic deformation of polycrystalline metals and strongly affect the evolution of microstructure and crystallographic texture during heat treatment processes. In FCC metals like Aluminium alloys, which show very high anisotropy due to texture evolved, it is important to understand the development of sub-structure in each step of processing chain. The most common way of estimating the dislocation densities is Transmission Electron Microscopy (TEM), however, this method is time costly and provides information, which is limited to one or few grains. Electron Back Scattering Diffraction (EBSD) has larger field of view compared to TEM and gives information about the geometrically necessary dislocations, whereas the statistically stored counterparts cannot be assessed. Alternatively to TEM and EBSD, indirect methods, such as X-ray line profile analysis or indentation techniques are widely used for the assessment of dislocation density in the deformed materials. In this piece of work we analyse the evolution of dislocations in Al alloys rolled with various thickness reduction by implementing the complementary ways of dislocation density estimation. The results obtained from various methodologies are compared with each other.

Keywords: Al alloys, deformation, dislocations, indentation.

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