3D investigations of reasons for texture changes during recrystallization

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Abstract

Non-destructive 3D characterizations give unique possibilities of following the microstructural and orientational changes during annealing, and thus to pinpoint reasons for texture changes during recrystallization. In the presentation, results related to nucleation in cold rolled aluminum AA5182, and to migration of boundaries surrounding recrystallizing grains in pure aluminum obtained using synchrotron X-ray methods are reviewed with a focus on orientation relationships. In AA5182, it appears that the nuclei develop with orientations as those present in the deformed microstructure, with a vast majority of the nuclei originating from particle stimulated nucleation (PSN). It is discussed what additional information 3D studies of nucleation offer as opposed studies done in 2D, in particular when it comes to quantifying PSN. For growth during recrystallization, some orientation dependence is found, but also other reasons related to the morphology of the deformation microstructure and to the spatial distribution of local strains are essential. It is discussed how these effects affect the texture development. Whereas synchrotron methodologies offer the best spatial resolution for microstructural mapping, as compared to lab X-ray methods, the challenge of getting enough measurement time at synchrotron sources suggests an extended use of the lab possibilities wherever that may be sufficient. Ideas and preliminary results related to further development towards higher spatial resolution of laboratory diffraction contrast tomography (LabDCT) are presented in the final part of this talk.

Keywords: Recrystallization, Nucleation, Boundary migration, 3D characterization

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