Remarks on the Modeling of Deformation-Induced Crystallographic Textures

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This work discusses several aspects of crystallographic texture prediction using deformation models. In general, two principal approaches to texture modelling and analysis can be distinguished, analogous to those employed in fluid flow descriptions.

In the Lagrangian approach, the evolution of the lattice orientation of each grain is tracked in orientation space, and the final texture is determined from the set of final lattice orientations of all grains. In contrast, in the Eulerian approach, the intensity of the texture function is evaluated at different points in orientation space using the rotation field of crystal orientations, in a manner analogous to the velocity field in fluid flow. In this case, the evolution of texture is described using the continuity equation.

The results of texture prediction and misorientation distribution obtained using the first method, namely the Lagrangian description combined with a crystalline deformation model, are presented and compared with experimental data. The textures of polycrystalline copper, brass, and low-carbon steel are analyzed. Furthermore, an approach based on local grain–neighbor interactions is compared with one based on average global interaction.

In addition, the prediction of copper-type texture and the stability conditions of the main components of the three examined texture types are analyzed using the Eulerian approach and the continuity equation.

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