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DLR – DAAD Fellowships

Fellowship No. 530

Research Area : Space

Research Topic: ***Crystallographic Dendrite Orientations in Solidification Processes***

DLR Institute: Institute of Materials Physics in Space, DLR Cologne

Position: Postdoctoral Fellow

Openings: 1

Job Specification: In recent decades, experimental results have shown that there are deviations from the simple correlation of growth morphologies with the underlying crystal structure in some metallic alloys. Dendrites in FCC alloys (e.g. Al-Cu, Al-Ge) can show <100>, <110> or <111> crystallographic growth directions depending on composition and thermal process conditions. To date, the physical origins of these transitions are not yet clearly understood and therefore cannot be predicted. Understanding the physical phenomena governing the pattern selection in alloys is not only of fundamental interest, as certain crystallographic orientations can be favorable with respect to defect formation in alloys used for technical applications. The objective of this project is to elaborate the influence of alloy composition, microalloying elements and thermal process conditions on the crystallographic growth orientation selection. Alloys likely to undergo a dendrite orientation transition and solute additions whose main role is to alter the dendrite morphology shall be identified. The aim is eventually to better understand the influence of interfacial properties, in particular the anisotropy of interfacial free energy and mobility, on the selection of dendritic patterns. To achieve this, solidification experiments under near-equilibrium conditions will be performed to obtain a more detailed view on the effect of solute enrichment at the solid-liquid interface along the solidification path. X-ray investigations will be employed as it enables to observe the growing microstructure and the redistribution of solutes for different alloys and compositions in situ. Furthermore, fast solidification experiments will help to understand the effect of atom attachment kinetics on the microstructure.

In combination with ex situ electron backscatter diffraction analysis crystallographic growth orientations will be characterized. The study will open up new opportunities for texture control. Ideally, the successful candidate has a strong background in solid-state physics and a sound experience with experiments using X-ray imaging techniques and their analysis. The fellowship is scheduled for a duration of two years.

Required Qualification: PhD in Physics, Materials Sciences or Mechanical Engineering

Advantageous Skills: Knowledge of metallurgy and crystallography; experience in the use of X-ray imaging techniques and image processing.

English competence: See requirements on www.daad.de/dlr

Fluent in spoken and written English

Earliest Start Date: Instantly

Application Deadline: Until position filled

Further Information: http://www.dlr.de/mp
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