3rd semester PhD Project Report

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PhD Topic: Investigation of recrystallization phenomena in face-centered-cubic polycrystalline systems

Description: Recrystallization occurs in polycrystalline materials during thermo-mechanical processing (TMP). This phenomenon involves recovery, nucleation, grain growth and in some instances abnormal grain growth. The kinetics of each mention event is a function temperature, degree of deformation and time. In polycrystalline aggregates with face-centered cubic (FCC) structure, only several types of crystallographic orientations (also called texture components) tend to appear during the softening process. Additionally, this typical texture is disturbed in the case of particle containing alloys, where particle stimulated nucleation occurs after a certain straining level. However, the crystallographic textures evolved usually account for a strong anisotropy of mechanical properties, which is a main disadvantage of using light metals like Al alloys in the light-weight applications due to the poor performance during forming or drawing. Therefore, investigation of crystallographic texture evolution is of particular importance, since texture is a major source of anisotropy in metals. The proposed project aims to make the fundamental breakthroughs needed to enable the development of efficient materials with suitable mechanical properties via optimization of both microstructural characteristics and texture. The goal of this research can be reached via detailed investigation of texture evolution during recrystallization by various analytical techniques such as orientation imaging microscopy, indentation techniques and investigation of mechanical properties, which will enable the modeling of plastic anisotropy in the investigated alloys.

Subjects Registered

Courses	Remark / Grade
Amorphous alloys	Excellent/ 5
Transmission electron microscopy and electron diffraction	Yet to appear

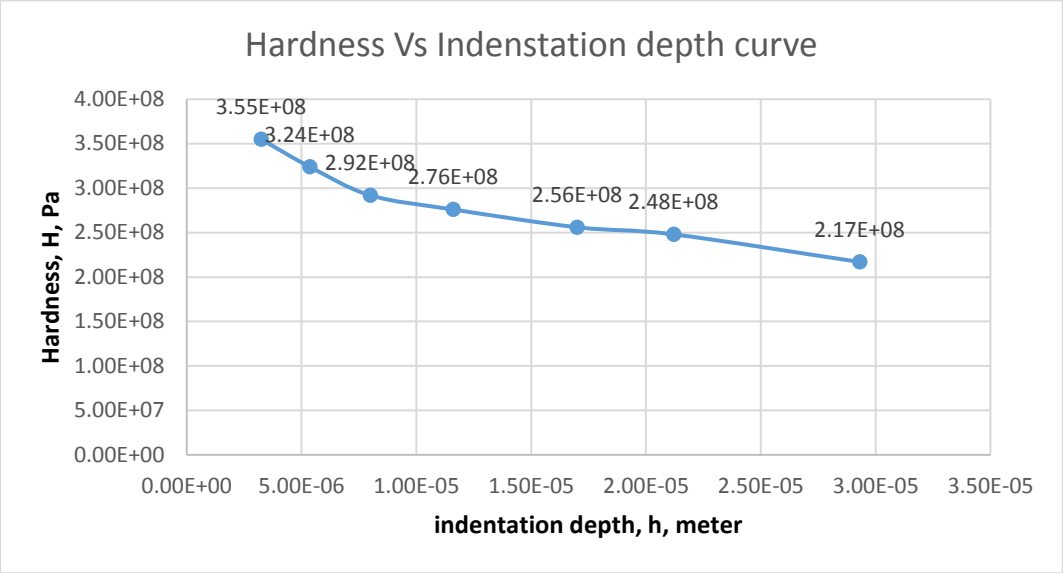
Other Academic Activities:

Co-supervised undergraduate project	Sub:- Felhalmozott deformációs energia meghatározása a polikristá-lyos rendszerekben	On going
Co-supervised undergraduate project	Sub- Theoretical aspect of Investigation of microstructure evolution in metallic systems by employing microscopy and indentation techniques	On going

Research activities:

- Lab work has been proceeded with Aluminium 1050 and Aluminum 6082 alloys. Alloy 1050 is almost pure form of Al with minimum alloying and has been chosen to analyze relative properties. Material Al 1050 has been deformed upto different % reduction and dislocation

density of the material has calculated using Vickers hardness testing and XRD. Dislocation density of the material is been also calculated theoretically in support of practical methods. For example, the chart below shows data for Al1050 sample



The density of geometrically necessary dislocations obtained from above hardness measurement values is 1.81*10^14 m^-2 whereas for the same sample dislocation density obtained from XRD experiments are 1.2*10^14 m^-2.

- From the respective dislocation density further, we plan to obtain the driving force for recrystallization to study the kinetics of recrystallization for the chosen systems.