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Master's project/ Master's thesis in Materials Science and Engineering

Investigation and Statistical Analysis of Silicon Precipitates in Al 6xxx Alloys after Homogenization and Reheating

Project advisers:

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Context:

The production of recycled aluminum reduces carbon emissions compared to primary aluminum production. Nevertheless, in recycling products, specific elements contribute to the formation of intermetallics containing Fe and Mn, thereby influencing their number density. These intermetallics play a crucial role in facilitating the nucleation of Si precipitates. In addition, exploring the kinetics of precipitates has consistently been a point of interest in various alloys, since precipitation significantly impacts both recrystallization and the final texture of the material. This influence extends to the processability and ultimate sheet properties, including formability, surface quality, and bending capabilities. The alloy composition and heating profiles indeed play a significant role in determining the size distribution of these precipitates. Analyzing the final distribution of precipitates is imperative for a comprehensive understanding of their evolution under different heating profiles. This knowledge enables the industry to use more recycled products, expanding alloy compositions.

Proposed work:

The primary objective of this project is to explore the kinetics of Si precipitation in Al 6xxx alloys with varying compositions. To accomplish this, alloys will undergo a two-step heat treatment process, involving homogenization followed by a salt bath experiment at different holding times and temperatures. The student will be initially trained in sample preparation, heat treatments procedure, and utilizing electron microscopy. Subsequently, SEM data will be subjected to statistical analysis through dedicated software. The software will automatically provide information on the volume fraction, number density, and mean radius of Si precipitates. The ultimate outcome will encompass their size distribution.

Candidate profiles: The candidate should have a bachelor in materials science, be curious and resilient, and should like observing, data analyzing, and understanding.

Location: EPFL-LMTM (Neuchâtel, Switzerland)

Please **apply** via email to ezzatollah.moosavi@epfl.ch using the subject line "Master's application for LMTM – Your Name". Please provide your CV incl. grades.