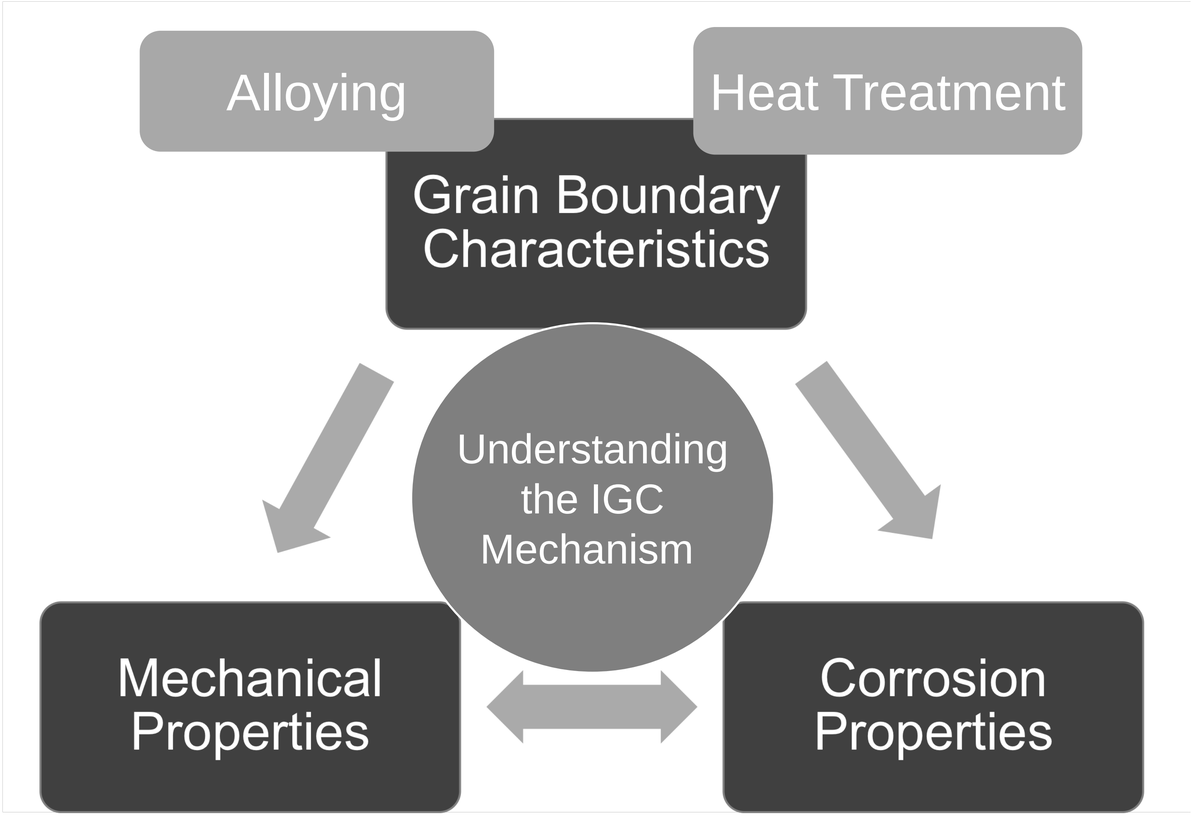
P22 - UnICorn

AMAP Advanced Metals and Processes

Executive Summary

Aluminum alloys of the 6xxx series are widely used due to their relatively high strength, good formability and good corrosion resistance. They are, however, prone to intergranular corrosion (IGC) dependent on the alloying and heat treatment state.
The amount of copper, as well as the Mg/Si ratio, is expected to have an influence on the IGC of 6xxx alloys. Mg and Si form the Mg_2Si-Phase, which is known to induce localized corrosion, while copper segregates at grain boundaries and forms a depletion zone that is able to promote IGC. Both effects depend on the precipitation of the phases and can be effectively influenced by the heat treatment conditions.



Schematic project aim: to identify the correlations between grain boundary phase precipitation and both the mechanical and corrosion properties, in order to better understand the intergranular corrosion mechanism.

The present project will undertake a methodical investigation on the mechanism of intergranular corrosion in 6xxx alloys. The influence of the Mg/Si ratio, the copper content, and the heat treatment on phase precipitation and its effect on intergranular corrosion will be analyzed.

Additionally, the influence of the forming process on the microstructure will be characterized. All alloys will be further analyzed by electrochemical and mechanical tests. The intergranular corrosion mechanisms will be investigated through extensive microstructural analyses.

Scope

AMAP UnICorn includes the following aspects:

- Hardness and grain size examinations dependent on the alloy and heat treatment
- IGC tests and identification of corrosion mechanism
- Electrochemical testing via cyclic polarization
- Extensive microstructural analyses
  - SEM/EDX
  - DSC
  - TEM
  - STEM (EDX, EELS)
  - APT

Consortium

The international project consortium consists of three industrial partners, Hydro, Trimet, Otto Fuchs and one institute of the RWTH Aachen University, the Chair of Corrosion and Corrosion Protection.

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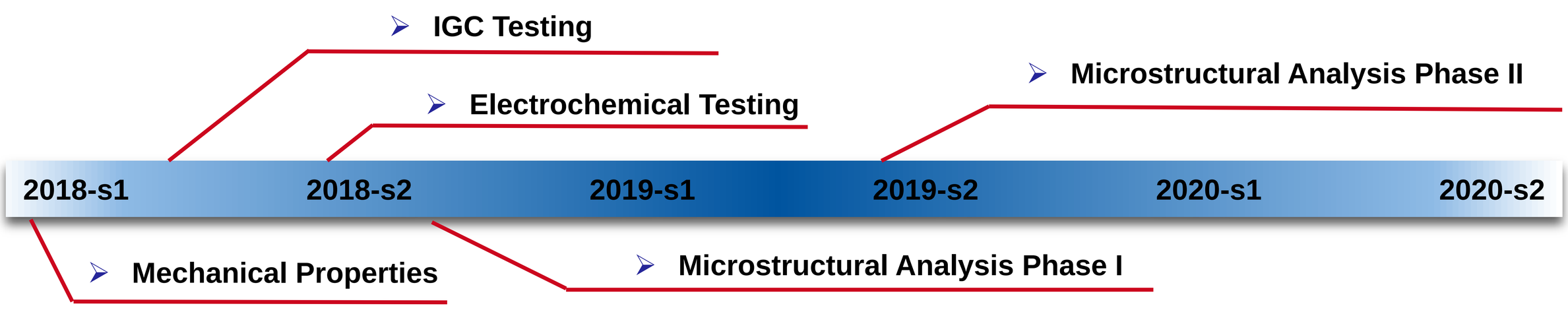
Timeline



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