Offre de Stage M2 (H/F)

Caractérisation avancée de la corrosion des alliages d'aluminium de la série 7xxx recyclés : tolérances aux impuretés chimiques

Lieu : laboratoire CIRIMAT , Toulouse - France
Date de début souhaitée : 02/02/2027, pour une durée de 6 mois
Employeur : Toulouse-INP - Salaire 4.5 EUROS/hour worked ~ 677 € net /month
Contacts : Nathalia Verissimo, nathalia.verissimo@toulouse-inp.fr

Description du projet

Aluminium (Al) alloys are widely used due to their low density, high strength, and excellent corrosion resistance. They stand out from ferrous materials because of their superior ductility, conductivity, and recyclability, making them ideal for automotive and aerospace applications. Although aluminum led base metal production in 2024 at 72 million metric tons, only 33% came from scrap because closed-loop applications are constrained by technical barriers such as oxide separation and high iron impurity buildup, which degrade the protective adherence of the surface passive film and accelerate localised corrosion. Despite decades of research, the specific roles of individual elements and their effects on the nanoscale structure of this oxide film in multicomponent Al alloys remain unresolved. These factors complicate selective separation processes, while conventional removal methods are energy-intensive and environmentally harmful. A promising approach is to design Al 7xxx alloys that tolerate impurities, improving recycling efficiency by utilising mixed scraps to support the production of high-performance materials. Therefore, a central challenge is determining how impurities alter corrosion resistance by establishing a direct link between the corrosion resistance of Al-7xxx alloys, the oxide film's near-atomic structure through investigations of oxide growth and interfacial segregation at the nanoscale, and impurity concentration, using advanced chemical and electrochemical characterisation techniques.

The ultimate aim is to identify the influence of impurities in model Al 7xxx alloys using electrochemical techniques. This involves addressing intermetallic formation and correlating microstructural features with corrosion properties.

The Master's 2 internship is designed to study the relationship between microstructural features of 7xxx series recycled alloys and their corrosion behaviour.

The work to be done can be described in three phases: Phase 1: bibliographical study of the state of the art regarding recycling of Al alloys and the microstructure of 7xxx alloy series.

Phase 2: study of the microstructural features, like intermetallic distribution and composition of the recycled 7xxx series alloy. This work will be based on observations using optical microscopy, scanning electron microscopy and transmission electron microscopy, as well as characterisation using EBSD.

Phase 3: study of the electrochemical behaviour of the recycled Al 7xxx alloys under corrosive media and correlation with microstructural features. Corrosion studies are expected to be carried out using electrochemical techniques such as potentiodynamic polarisation and electrochemical impedance spectroscopy.

Keywords: Al alloys, recycling, corrosion

Contexte du projet

Le CIRIMAT compte environ 240 personnes dont un peu plus de 100 permanents.
Il mène des recherches pluridisciplinaires sur les grandes familles de matériaux (métaux, alliages, céramiques, polymères, composites, multimatériaux) sous forme de poudres, films minces, revêtements, pièces massives, depuis leur conception jusqu'à leur

comportement en service.
Ces recherches, fondamentales et appliquées, s'inscrivent dans le cadre de problématiques à fort impact industriel et sociétal (aéronautique, spatial, énergie, santé.).

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Profil recherché

Applicants must have significant knowledge of materials science. The internship corresponds to experimental work.

Modalités de candidature

Date limite pour postuler : 23/11/2026

Application forms (CV + letter of motivation) must be sent before November 12, 2026 at 18:00 am to: Nathália Verissimo - nathalia.verissimo@toulouse-inp.fr Christine Blanc – christine.blanc@ensiacet.fr

Stage M2 offer (M/F)

Advanced Corrosion Characterisation of Recycled Al 7xxx Alloys: chemical impurity tolerances Law

Location : CIRIMAT laboratory , Toulouse - France
Starting date : 02/02/2027, Contract duration : 6 months
Employer : Toulouse-INP - Salary 4.5 EUROS/hour worked ~ 677 € net /month
Contacts : Contacts : Nathalia Verissimo, nathalia.verissimo@toulouse-inp.fr

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Work context

CIRIMAT has about 240 researchers, including just over 100 permanent staff.
The laboratory conducts multidisciplinary research on major classes of materials (metals, alloys, ceramics, polymers, composites, multimaterials) in the form of powders, thin films, coatings, and bulk pieces, from their design to their in-service behavior.
Both fundamental and applied research are carried out within the laboratory, addressing issues with strong industrial and societal

impact (aeronautics, space, energy, health, etc.).

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Applicant's profile

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How to apply

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