Master Thesis - “Characterization Study of High Temperature Superalloy” (30 credits/20 weeks – 1 student)

About us

GKN Aerospace is the world’s leading multi-technology tier 1 aerospace supplier. With 33 manufacturing locations in 12 countries, we serve over 90% of the world’s aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world’s advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

Project Background

As the demand for increased jet engine efficiency continues to rise, so does the need for engines to operate at higher temperatures. Higher operating temperatures can significantly improve the thermal efficiency of jet engines, leading to better fuel economy and reduced emissions. However, this increase in temperature places tremendous stress on the materials used in engine components. These materials must withstand extreme thermal and mechanical loads without losing their structural integrity. To meet these demanding conditions, the properties of the materials used in jet engines become critically important. High-temperature materials must exhibit exceptional strength, oxidation resistance, and creep resistance to ensure reliable performance over extended periods. Among these materials, nickel-based superalloys stand out due to their superior high-temperature capabilities.

Alloy 247 is a precipitation-strengthened nickel-base superalloy commonly used in high-temperature applications. The microstructure and resulting material properties of Alloy 247 are strongly influenced by heat treatment, which governs the morphology, size, distribution, and volume fraction of strengthening precipitates and consequently, the performance of the material.

This project focuses on the Processing-Structure relationship, the first link of the central paradigm in materials science and engineering. Three different heat treatment cycles have been designed using CALPHAD-based methodologies and subsequently applied to the additively manufactured Alloy 247. The objective of this thesis is to evaluate the material’s response to these heat treatments by investigating their influence on the microstructural evolution and identifying the resulting processing-structure relationships.

We are currently seeking a motivated student who is interested in exploring the fascinating world of precipitation-strengthened Nickel-base superalloys for high-temperature applications.

Assignment Description

- Familiarize with the topic and make a detailed plan of the project
- Conduct an extensive literature review focused on precipitation-strengthened Nickel-base superalloys, with particular emphasis on Alloy 247.
- Characterization of the microstructure using methods such as LOM, SEM, and EBSD.
- Compile and analyze the results and assess whether the experimental results validate the CALPHAD calculations.
- Document and present your findings at your university and GKN Aerospace

Qualifications

- Student in the final year of their M.Sc. studies in the field of materials engineering or similar, with a strong interest in metallurgy
- An interest in additive manufacturing and experimental work is beneficial.

Apply by

Send your resume and cover letter to

Daniel Leon, Daniel.leon@gknaerospace.com

Bengt Pettersson, Bengt.e.Pettersson@gknaerospace.com

Last date for application: 2026-12-31. Interviews will be held continuously, and the position could be filled prior to the last application date.