Projektsammanfattning

Projekttitel på svenska (max 80 tecken) Ny lättviktslegering baserad på högentropikonceptet	
Projekttitel på engelska (max 80 tecken) Novel light alloy development based on the high entropy concept	
Akronym (max 10 tecken) NOVELA	
Erbjudande ☒ Genomförbarhetsstudie ☐ FoI-projekt	Projektet bygger vidare på resultat från ett tidigare projekt ☒ ja, med stöd från Vinnova (Projekts diarienummer: 2017-02509) ☐ ja, med stöd från finansiär (avser offentlig finansiering). ☐ nej
Projektet är ☐ i sin helhet samma projekt som har insänts till annan finansiär, nämligen: finansiär ☒ i delar samma projekt som har insänts till annan finansiär, nämligen: Åforsk	
Finns uppgifter om affärs- och driftsförhållanden som skulle kunna leda till skada om de offentliggörs ☐ ja ☐ nej	

Sammanfattning (max 1500 tecken) – *Denna ska skrivas så att en extern bedömare ska kunna förstå syftet och innehållet i projektet.*

Projektet NOVELA syftar till att utveckla högpresterande Al-baserade legeringar som har förbättrad styrka i jämförelse med nuvarande höghållfasta Al-legeringar, samtidigt som densiteten minskas. Byte av tunga delar med hjälp av de lätta högprestandade komponenterna minskar energiförbrukningen och därmed minskar koldioxid fotavtrycket i många industrier som är slutanvändare av metalldelar, såsom transport och hushållssektorer. Förutom optimering av komponentdesignen krävs att man uppfyller efterfrågan av lättvikts lösningar som kräver ytterligare utveckling av avancerade högpresterande lättviktslegeringar. Utveckling av Al-legeringar som en av de vanligaste lättvikts legeringarna har reducerats på grund av de begränsningar som fastställs av konventionella legerings utvecklingar. Denna forskning kombinerar traditionella legerings utveckling med en banbrytande legerings strategi (hög entropilegeringar) för att utveckla en ny generation Al-legeringar. Målet är att utveckla lättviktslegeringar med förbättrad specifik styrka och strukturell stabilitet jämfört med befintliga Al- (och Al-Titan) baserade legeringar vid rums och förhöjda temperaturer, upp till 250 °C. Projektet integrerar beräkning av termodynamik och experimentella undersökningar för att designa, producera och karakterisera Al-baserade entropilegeringar (medium-till-hög). Framgångsrikt genomförande av projektidén kommer att bidra till utvecklingen av avancerade högpresterande legeringar för hårda miljö applikationer.

Sammanfattning på engelska (max 1500 tecken)

The NOVELA project aims at developing modern high-performance Al-based alloys that possess improved strength over current high-strength Al alloys while reducing the density. The replacement of heavy parts by the lightweight high-performance components reduces energy (fuel) consumption, and thus the carbon footprint in the many industries that are end-users of metallic parts; such as transportation and household sectors. Beside component design optimization, fulfilling the lightweight demand requires further development of advanced high-performance light alloys. Development of Al alloys as one of the most commonly used light alloys has been stagnated due to the limitations set by conventional alloy

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design routines. This feasibility research combines traditional alloy design routines (e.g., precipitation hardening) with a ground-breaking alloy design strategy (high entropy alloys) to develop a new generation of Al alloys. The goal is to develop light alloys with improved specific strength (strength to density ratio), and structural stability compared to the existing Al- (and AlTi-) based alloys at room and elevated temperatures, up to 250°C in this project. The project integrates computational thermodynamics and experimental investigations to design, produce and characterize Al-based medium-to-high entropy alloys. Successful implementation of the project idea will contribute to the development of advanced high-performance alloy solution for harsh environment applications.	
Startdatum 2019-09-01	Slutdatum 2020-08-31
Totalt sökt stöd (SEK) 800,000	Total medfinansiering (SEK) 200,000

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1. Projektets idé

The NOVELA project aims at developing the next-generation high-performance light alloys (Al-alloys) that possess improved strength over current engineering light alloys while reducing the density. The replacement of heavy parts by the lightweight high-performance components reduces energy (fuel) consumption, and thus the carbon footprint in the many industries that are end-users of metallic parts; such as aerospace, automotive and household sectors, as intended end-users. Beside component design optimization, fulfilling the lightweight demand requires further development of advanced high-performance light alloys. Development of Al alloys as one of the most commonly used light alloys has been slowed down due to the limitations set by conventional alloy design routines. This feasibility research combines traditional alloy design routines with a ground-breaking alloy design strategy (high entropy alloys) to develop a new generation of Al-alloys. The modified alloys designed and produced in this project are expected to possess improved specific strength (strength to density ratio), and structural stability compared to the existing light alloys at room and elevated temperatures, up to 250°C. Successful implementation of the project idea will contribute to the development of advanced high-performance alloy solution for harsh environment applications. This feasibility study is an excellent ground for further improvement in the technology readiness level (TRL) of the idea for the near future. It is expected to continue the research after the NOVELA project in order to increase the TRL level from 3-4 to 7-8 within the next 10 coming years.

Projektets bidrag till programmålen

Among other themes, the project goals are aligned with the LIGHTer innovation-theme #4 (Lättare genom förbättrade egenskaper och innovativa lösningar), where one of the main aims is to decrease the weight through improved properties and new innovative solutions. The project idea can lead to >20% reduction in density of the conventional metallic alloys with the same performance (same strength). Developing the next generation of high-performance light alloys opens a new door for replacement of heavy components in the industry, which will have a direct impact on energy consumption. Besides, improving the durability of light alloys will decrease the frequent need for service and maintenance in many applications that directly affect the sustainability aspects of the industry and society.

2. Projektets aktörskonstellation

The consortium consists of experts in the value chain of sustainable metallic product development, including university researchers, alloy designer, and end-users. This ensures high-quality research leading to a relatively quick implementation into real applications, considering the industrial needs. All partners will have at least one representative in the project group dealing with daily activities and risk management. The project will be carried out at the Department of Materials and Manufacturing, School of Engineering at Jönköping University (JTH), in close collaboration with the involved industrial partners: GKN Aerospace Sweden (GKN), Husqvarna and Thermo-Calc Software. GKN and Husqvarna as the end-users define and follow up the alloy design criteria based on their applications. As a consultancy with ThermoCals Software AB, the alloy design process is conducted using computational thermodynamic modeling. Thermo-Calc Software will also get the chance to re-evaluate their related databases and apply required modifications in their algorithms. JTH will conduct the computational and experimental work accordingly.

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