I/UCRC Executive Summary - Project Synopsis	**Date**: April 3, 2018

Center/Site: Center for Advanced Non-Ferrous Structural Alloys (CANFSA) / Colorado School of Mines

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Center/Site Director: CANFSA / Amy Clarke		**Type: Continuing**
Project Leader: Joseph Jankowski		**Proposed Budget**: $200,000

Project Description: This goal of this project is to develop a low-cost aluminum structural alloy for high service temperature applications. This will be done by utilizing the microeutectic microstructure formed between Al and the alpha-phase intermetallic. In order to accomplish this, modifications to the baseline alloy 8009 (Al-Fe-V-Si) are proposed on the basis of density functional theory (DFT) calculations and experimental validation. If successful, the alloy could have a service temperature as high as 400 degrees Celsius with a low-cost due to compatibility with conventional processing routes, unlike the high temperature Al alloys currently available.

Experimental plan: In order to assess the value of the Al + alpha microeutectic, several experiments will be performed. First, a crystallographic study of the alpha phase combined with DFT analysis will be performed. Second, the ability to produce desirable structures in a chill casting will be assessed. Finally, the solidification behavior will be studied using autogenous welds.

Related work elsewhere: There is an ongoing project similar to this one being performed at Oak Ridge National Laboratory on Al-Ce eutectic alloys.

How this project is different: This project is expected to yield an alloy with better high temperature stability and potentially higher strength since the volume fraction of the reinforcing phase appears to be relatively easily to change compared to most conventional eutectics.

Milestones for the current proposed year: The milestones are as follows: 1) develop a model of the alpha-phase 2) determine the alloy system to examine in detail 3) develop parameters for a welding study 4) assess ability to produce favorable microstructures in a chill casting and 4) use DFT to develop compositional rules for the alpha-phase.

Deliverables for the current proposed year: The main deliverable for this year is a publication on the crystal structure of the Al-Fe-V-Si h-phase in 8009 that was determined earlier in this work. A publication will likely be written on the crystal structure of the alpha-phase across several alloy systems.

How the project may be transformative and/or benefit society: The development of a low-cost Al alloy with high service temperatures will allow for steel and titanium parts to be replaced with Al. This will help improve fuel efficiency and reduce cost, especially in the automotive industry.

Research areas of expertise needed for project success: Crystallography, Solid State Physics (Electronic Structure), Physical Metallurgy, Characterization, Casting

Potential Member Company Benefits: Pre-competitive research to develop an innovative alloy system that can be refined to meet the specific needs of member companies.

Progress to Date: Development of rough compositional guidelines on producing Al + alpha microeutectic systems outside of the baseline Al-Fe-V-Si system. Identification of promising alloy systems for future.

Estimated Start Date: Fall 2015	**Estimated Knowledge Transfer Date**: Spring 2019