

# Project 29: Identification of Deformation Mechanisms of Thermally Stable Cast Al-Cu Alloys via Neutron Diffraction

- Student: Brian Milligan (Mines)
- Advisor(s): Amy Clarke (Mines), Amit Shyam (ORNL)

## Project Duration

PhD: August 2017 to May 2021

### Problem

Thermally stable cast Al-Cu alloys developed at ORNL require characterization of mechanical properties.

### Objective

Apply in-situ neutron diffraction, SEM, TEM, and traditional mechanical testing to better understand the mechanical behavior of these alloys.

### Benefit

Improvement of properties of these alloys, as well as furthering scientific understanding of precipitation strengthened Al alloys.

### Recent Progress

- Paper on creep properties of Al alloys at 300 and 350 °C in preparation.
- Paper on room temperature deformation mechanisms in 206 Al in preparation.
- Identified deformation mechanisms in 206 Al under various aging conditions
- Quantification of precipitate cutting underway.
- User proposal submitted to APS at Argonne National Laboratory to study precipitation and growth kinetics using TXM.

## Metrics

Description	% Complete	Status
1. Literature review	80%	●
2. <i>In situ</i> neutron diffraction at the SNS, and creep testing at CSM and ORNL	80%	●
3. Microstructural characterization pre- and post- creep and tension	60%	●
4. Analysis of neutron diffraction data	80%	●
5. Development of models for grain orientation-dependent tensile and creep properties	40%	●



IOWA STATE  
UNIVERSITY



**Center Proprietary – Terms of CANFSA  
Membership Agreement Apply**