

***Project 56-L: Thermomechanical Processing of
Refractory Multi-Principal Element Alloys for
Ultrahigh Temperature Performance***

***Semi-annual Fall Meeting
October 2021***

- Student: Adira Balzac (Mines)
- Faculty: Amy Clarke (Mines)
- Industrial Mentors: TBD



Project 56-L: Thermomechanical Processing of Refractory Multi-Principal Element Alloys for Ultrahigh Temperature Performance



- Student: Adira Balzac (Mines)
- Advisor(s): Amy Clarke (Mines)

Project Duration
PhD: September 2021 to May 2025

- **Problem:** Ni and Co alloys cannot be operated above 1100°C without coatings and cooling channels that reduce efficiency. RMPEAs can be used at higher temperatures, but thermomechanical processing is challenging.
- **Objective:** Design RMPEAs with higher temperature performance and develop understanding of alloy and microstructure response to thermomechanical processing above 1000°C.
- **Benefit:** Refractory MPEAs that can be operated above 1200°C will allow for significant improvements in efficiency.

- Recent Progress**
- Literature review
 - Initiated coursework
 - Initial Thermo-Calc, kinetic, and solid solution strengthening modeling
 - Gleeble thermomechanical simulator and electron microscopy training
 - Baseline alloy selection (F. Coury thesis)

Metrics		
Description	% Complete	Status
1. Literature review	15%	●
2. Thermodynamic, kinetic, and solid solution strengthening modeling to select RMPEAs	0%	●
3. High temperature thermomechanical processing of selected RMPEAs	0%	●
4. High temperature thermomechanical processing of RMPEAs with higher oxygen and carbon levels	0%	●
5. Characterization of RMPEAs	0%	●

About Me



- Earned B.S. degree in Materials Science and Engineering from the Massachusetts Institute of Technology in June 2021
- O-REU at Texas A&M University in Summer 2020 with Dr. Jeffrey Bullard, developing phase field models of sintering.
- Hobbies
 - Blacksmithing and other metalworking
 - Firespinning
 - Creative writing
 - Playing with my cats



Thank you!
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