

Center for Advanced **Non-Ferrous Structural Alloys** An Industry/University Cooperative Research Center

Project 40-L: Evaluation of Processing Path Effects on Microstructure and Properties of **Powder-Based AL-TM alloy.**

Spring Meeting April 7th – 9th 2020

- Student: Stuart Shirley (Mines)
- Faculty: Kester Clarke (Mines)
- Industrial Mentors: Rob Mayer Queen City Forge



Project 40-L: Evaluation of Processing Path Effects on Microstructure and **Properties of Powder AL-TM alloy.**



 Student: Stuart Shirley (Mines) Advisor(s): Kester Clarke (Mines) 	Project Duration Masters: August 2019 to December 2021
 Problem: AI-TM alloys have excellent performance, but can be challenging to process via conventional processing pathways Objective: Evaluate the effect of processing path on the microstructure and mechanical properties of AI-TM alloy. Benefit: Improved understanding of processing path effects on microstructure and properties AI-TM powders. 	 <u>Recent Progress</u> Polishing of AI-TM samples Literature review Fall courses completed

Metrics		
Description	% Complete	Status
1. Literature review	30	•
2. Microstructure Characterization of Forged AL-TM	10	•
3. Microstructure Characterization of Additive Friction Stir Deposition (AFSD)	0	•
4. Microstructure Characterization of ShAPE AL-TM alloy	10	•
5. Thermomechanical Processing	0	•
SPRING CANFSA MEETING – APRIL 2020 Center Proprietary – Terms of CANFSA Membership Agreement Apply		2







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Material of Interest



Received Material

- Extruded
 - Al-12.4 TM
 - Material from two extrusion ratios
- Forgings

- AL-12.4 TM



Material of Interest Cont.



- Shear Assisted Processing and Extrusion
 - Two powder sizes



Anticipated Material

- Additive Friction Stir Deposition
 - Supplied by MELD
 - Possible subsequent forging

• TMP

Traveling Europe





- 14 Blacksmiths
- 5 countries
- 3 universities

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University of Dortmund





















Challenges & Opportunities



- Polishing of AL-TM Alloys
 - Pitting during polishing
- Mechanical Testing
 - Hardness
 - Tensile
- Thermomechanical Processing
- EBSD

Thank you! Stuart Shirley sshirley@mines.edu