I/UCRC Executive Summary - Project Synopsis	**Date**: October 2021
Center/Site: CANFSA/Colorado School of Mines	
Tracking No. 44: Characterization of Particulate Materials Simulating High Explosives	**E-mail:** scamerlo@mines.edu **Phone:** (719) 289-1681
Center/Site Director: CANFSA/M. Kaufman/P. Collins/A. Clarke	**Type: (Continuing)**
Project Leader: Summer Camerlo	**Proposed Budget**: $160K, Leveraged
Project Description: The NNSA is interested in a mock high explosive (MHE) that contains IDOX crystals in a binder matrix. Before preparation and testing of MHE samples can begin, model particle/matrix systems will be characterized and their mechanical properties will be evaluated. These results will be used to develop and calibrate a computational framework being developed by the University of Colorado Boulder to predict MHE behaviors during processing and deformation.	
Experimental plan: Composite samples containing epoxy or resin embedded with particles (glass beads or angular sand) will be made for initial characterization and testing. The modeling framework derived from these results will then be applied to LANL's MHE, along with robust characterization and quasi-static to the dynamic characterization of mechanical properties.	
Related work elsewhere: MHEs have been studied extensively at the national labs because they are much safer and less expensive to work with than high explosives. This research has mainly centered on the MHEs LX-17 and PBX 9502.	
How this project is different: Current models show that LX-17 and PBX 9502 have similar loading responses to PBX 9501; however, their modulus and strength differs. IDOX-containing MHE shows great promise in more closely matching real HE's mechanical response. This project will center on experimental and computational studies of IDOX-containing MHE developed by LANL during processing and deformation.	
Milestones for the current proposed year: The creation of epoxy or resin/particle samples and recycled IDOX-containing MHE for computed tomography and mechanical testing, including in-situ and ex-situ testing.	
Deliverables for the current proposed year: Produce and characterize "model" particle/matrix samples and IDOX-containing MHE at Mines for subsequent mechanical testing. X-ray computed tomography will be used, for example, to characterize particle/matrix samples in three-dimensions.	
How the project may be transformative and/or benefit society: This work will enable the prediction of IDOX-containing MHE behavior during processing or deformation, with extension to HE simulations of interest to the NNSA.	
Research areas of expertise needed for project success: X-ray radiography and computed tomography; mechanical testing; mechanical properties; materials processing and characterization	
Potential Member Company Benefits: This work will build an experimentally validated computational framework for assessing MHE and HE, saving time and cost to test these materials.	
Progress to Date: Initial particle/epoxy samples have been created, quasi-static compression testing of particle/matrix and matrix samples, pressing of (LANL) IDOX-containing MHE samples from recycled machining fines, computed tomography, and mechanical testing of both pristine IDOX MHE samples received from LANL and recycled MHE samples pressed at Mines have been performed.	
Estimated Start Date: Fall 2020	**Estimated Knowledge Transfer Date**: Summer 2022

The Executive Summary is used by corporate stakeholders in evaluating the value of their leveraged investment in the center and its projects. It also enables stakeholders to discuss and decide on the projects that provide value to their respective organizations. **Ideally, the tool is completed and shared in advance of IAB meetings to help enable rational decision making.**