

Structural and mechanical properties of asteroid regolith simulant

Cody Schultz,^{1,2} Dan Britt,^{1,2}

¹ *Physics Department, University of Central Florida, Orlando, FL 32816*

² *CLASS, University of Central Florida, Orlando, FL 32816*

cdschultz@knights.ucf.edu

Abstract. To visit, explore, and utilize the resources on asteroids we must characterize the structural and mechanical properties of regoliths that are likely to exist on these bodies. Meteorites sample the mineralogy, texture, chemistry, and mechanical properties of asteroidal surfaces provide the fundamental data. However, due to their cost and very limited supply they are simply unavailable in the quantities need for destructive or large-scale engineering investigations.

Our group^{1,2,3} has created a family of asteroid regolith simulants based on the mineralogy and mechanical properties of key meteorites. The first simulant developed is based on the CI carbonaceous asteroid Orgueil which is rich in clays, phyllosilicates, carbon compounds, and volatiles. The parent asteroids of this type of material are attractive targets for future exploration and ISRU missions. Our research has focused on understanding the structural and mechanical properties of this asteroid regolith simulant. Using this simulant, we are studying its strength and cohesion properties as well as its response to thermal cycling. We will present data on the hardness and compressive strength of our simulant. Our thermal cycling experiments characterize the hardness response of the simulant surface to temperature excursions of 200 C. From these studies, we hope to supply future researchers with insight into the mechanical evolution of asteroid surfaces and inputs for the design of robotic spacecraft and other future technologies that will interact with these alien surfaces.

¹ Covey S.D., Lewis J.S., Metzger P.T., and Britt D.T. (2016) Simulating the Surface Morphology of a Carbonaceous Chondrite Asteroid. Proceedings of 2016 ASCE Earth and Space Conference. Britt D.T. and

² Beltran E. (2016) Addressing Exploration and ISRU Safety Challenges for Volatile Rich Asteroids. Proceedings of 2016 ASCE Earth and Space Conference.

³ Metzger P.T., Britt D.T. and Lewis J.S. (2016) Results of the 2015 Workshop on Asteroid Simulants. Proceedings of 2016 ASCE Earth and Space Conference.