Ground Testing of Electrostatic Transport of Lunar Regolith Simulants with Applications to Electrostatic Sieving. P. Bachle[1], J. Smith[1], F. Rezaei[1], D. Bayless[1], W. Schonberg[1], and D. Han[1], [1]Missouri University of Science and Technology, 1870 Miner Circle, Rolla, MO 65409, (Contact: handao@mst.edu)

Introduction: Mineral benefication practice enhances and adapts the segregation tendencies of natural geologic processes to enhance the efficiency of subsequent processing and manufacturing tasks, which need appropriately sized and prepared mineral feedstock. Our LuSTR21 project directly addresses this need for lunar *in-situ* resource utilization (ISRU) through designing, building, and testing an integrated system comprised of a selection of separation subsytems for particle size classification and enrichment. At LSIC Fall Meeting 2022 we reported our progress on developing a modeling capability to simulate electrostatic transport of lunar regolith particles with applications to electrostatic sieving. Particularly, concept designs proposed by Kawamoto and Adachi [1] using traveling-wave configuration of electrodes are to be modeled and simulated. The electric field is solved by an immersed-finite-element (IFE) Poisson solver [2] while the motion of charged particle grains are tracked by a kinetic approach [3]. A typical electric potential solution is given in Fig.1 below, while Fig. 2 shows a screen shot of grain trajectories at a certain time step.

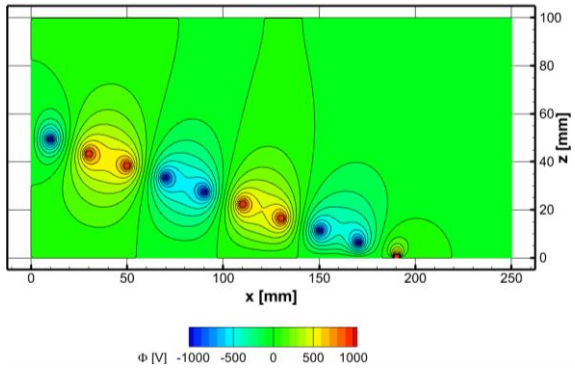

Fig. 1. Potential contours of one phase of a four-phase electrostatic traveling wave.

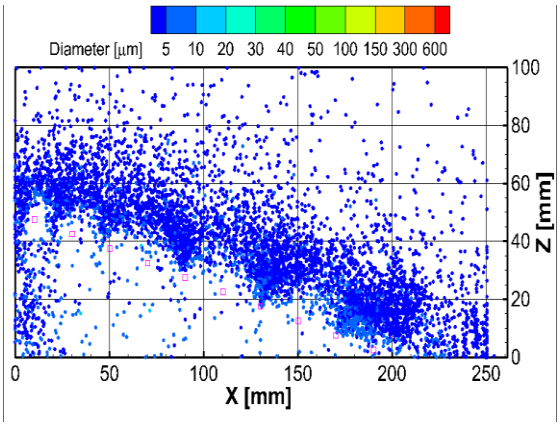

Fig. 2. Trajectories of grains at a selected time step. Grains are colored by size. Electrodes are shown as purple boxes.

For this upcoming LSIC Spring Meeting 2023 we will report our preliminary results on ground testing of the prototype electrostatic sieve hardware, as shown in Fig. 3. Particularly, efficiency of size classification of the electrostatic sieve concept will be compared with the modeling results.

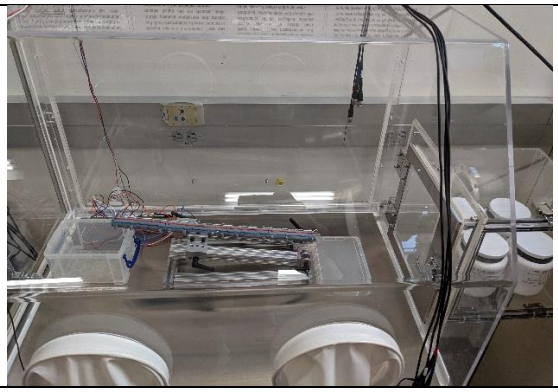

Fig. 3. The prototype of the electrostatic sieve as configured in a glove box ready to undergo testing of size separation of lunar simulants.

References: [1] Kawamoto and Adachi. (2014) *AIAA 2014-0341*. [2] Kafafy. et al. (2005) *Int. J. Num. Methods. Eng., 64, 940-972*. [3] Zhao. et al. (2022) *J. Aerospace Eng.*, 35(6): 04022095.