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## Microgravity Experiment for Lunar Dust (MELD): A platform to study lunar dust interactions with surfaces.

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### Abstract

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Lunar regolith is composed of particles ranging from fine dust to large rocks with primary elemental makeup of silicon (Si), iron (Fe), and titanium (Ti). Since the moon lacks atmospheric weathering, regolith particles remain sharp-edged, even at microscopic scales. Additionally, lunar dust carries a static charge, which makes it cling to surfaces upon contact. During landing, dust plumes can cause significant abrasive damage to equipment. To address this challenge, researchers are developing protective coatings that repel dust and enhance durability. In collaboration with Texas Women's University (TWU) and University of North Texas (UNT), this project focuses on creating coatings that not only repel lunar dust but also regulate heat dissipation in spacecraft and shield equipment from dust-related degradation. To study these effects, a vacuum chamber equipped with a dust cannon was built to replicate lunar vacuum conditions. The surfaces of bare silicon wafers and other materials were analyzed before and after lunar dust simulant exposure with Scanning Electron Microscopy (SEM), Profilometer, and FITR microscopy to evaluate the effectiveness of the coatings. FITR data will be used to determine the IR absorption and reflectance of the surfaces before and after dust simulate exposure.