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# EXTENDING THE UTILIZATION OF DUST PROTECTION SYSTEMS USING CARBON NANOTUBE EMBEDDED MATERIALS FOR LUNAR HABITATS FOR EXPLORATION MISSIONS

**Abstract**

With the increasing interest in establishment of long duration outposts with surface habitats for lunar exploration, it is imperative that we overcome the challenges posed by the lunar environment. The outerlayer of the habitat structures must be protected from the abrading effects of dust contamination. During the Apollo missions it was observed that lunar dust is electrically charged and has a high propensity to adhere, and due to jagged edges it can abrade surfaces. This is a hindrance and a major challenge for lunar surface operations. Materials utilized for space habitats need to be protected from the dust contamination and degradation to operate for long durations.

Our paper focuses on mitigating dust contamination of surface habitat structures applying the technology which was developed for dust mitigation on spacesuits. This Spacesuit Integrated Carbon nanotube Dust Ejection/Removal system (SPIcDER) is focused on preventing deposition of dust on flexible surfaces which are typically used on spacesuits and habitats. Pressurizable Lunar Inflatable Habitats (ILH) currently being developed will require protection from dust in order to maintain their durability and pressure holding capacity for long duration. We discuss design of SPIcDER customized for habitats including manufacturability for large pieces of flexible materials such as those used in inflatable habitats, and the factors that are critical for efficient implementation. We leverage lessons learned from tests conducted on SPIcDER utilizing small and medium scale prototype of spacesuit materials, and apply those to provide concepts for lunar habitats.