# Fabrication of Regolith-Derived Radiation Shields: Preliminary Results

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Unlike the Earth, Mars and asteroids do not have a magnetosphere to protect humans, mechanisms and electronics from damaging Galactic Cosmic Radiation (GCR) and solar particle events (SPE). This presents one of the highest risks to crew and onboard electronics during interplanetary journeys. The goal of this project is to evaluate the effectiveness of carbonaceous asteroids and other hydrogen-rich materials as potential radiation shielding materials, which ultimately could be tested during planned crewed missions to a captured asteroid fragment (ARM). This type of investigation represents an initial effort to develop radiation shield material compositions, production methods and technologies, and optimization methodology for manufacturing radiation shields in deep space for large exploration human missions or by emerging new industries seeking to stage their spacecraft for the exploitation of the resources of asteroids. Carbonaceous chondrites (C-type) are of particular interest as sources of compounds such as water ice and hydrogen-rich carbon molecules, which can provide sufficient low Z element density to provide radiation protection at adequate shield thicknesses.

We report on preliminary results of research performed at NASA Kennedy Space Center Swamp Works aimed at fabricating and testing radiation shielding materials processed in several ways to obtain consolidated structural test coupons: 1) Heat-free mechanical compression; 2) Moderate heat with compression; 3) Same but after mixing with plastic waste. The purpose is to identify the best method to obtain final products with optimal radiation shielding properties. The test coupons were evaluated for their ability to block radiation when exposed to beams of protons and gamma rays at DoE's Sandia National Laboratory. We will present the test data and early analysis that will support forward work in a Phase 2 effort. Phase 2 of this project will use knowledge previously gained in a 3D Additive Construction project using regolith to create layered radiation shield elements to examine fabrication techniques and final material properties.

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