The Development of an Efficient Space Radiation Shielding Fabric

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The purpose of this study was to create a space radiation shielding fabric that was thin, lightweight, and flexible. Polyethylene (PE) and boron nitride (BN) were the materials used to create this shield, chosen based on prior studies suggesting that PE and BN could shield high amounts of radiation. First, the ratio of BN to PE in the PE+BN combination fabric as well as the necessity of a bonding agent was determined. A 3D filament extruder was designed, and PE and PE+BN filaments were developed. Fabrics made of the aforementioned materials were 3D-printed, and a BN nanotube fabric was developed by flattening the nanotube masses. The radiation source alone, two different fabric configurations comprised of various quantities of each type of fabric, and a control group comprised of Kevlar, Mylar, and spandex fabric were tested. A single-factor ANOVA returned a p-value of 2.11E-154; a post-hoc Tukey Test indicated a statistically significant difference between all configurations, so the research hypothesis was supported. In conclusion, the radiation shielding fabric developed in this experiment was shown to be appropriate for use in long-term space travel, for a fabric combination .75 centimeters thick, lightweight, and flexible blocked 60% of gamma radiation from Cs-137.

Awards Won:
Second Award of $2,000