Revolutionizing Spacesuits: Strength Meets Science

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Shear-thickening fluids (STFs) were added to Kevlar to find their effect on force absorbed by material over a short period of time. This could be used in spacesuits to protect against micrometeoroid orbital debris (MMODs). These materials would be more preferable than what is currently being used because the thickness of layers would be significantly lowered. This would solve the problem of extremely high costs per spacesuit and sustainability of materials. It was hypothesized that fumed silica in polyethylene glycol (PEG) would spread out force through time the most efficiently. To test this, Kevlar was impregnated with various STFs and impacted with a weighted hammer in a load cell machine. The dependent variable tested was the amount (%) of solute in a PEG solvent compared to maximum Newton force and area under the curve when data is graphed. The independent variables were 3.85% fumed silica, 30% cornstarch, 40% fumed silica, and a mix of 3.85% fumed silica and 30% cornstarch. Controls include Kevlar as the material in all tests, each low, medium, and high tests at the same height for each corresponding drop, sample material size, and time under vacuum. After testing, it was deemed that medium and high drop data was within the range of error and was not used in any conclusion drawn. After graphing data, a conclusion was drawn that fumed silica in PEG was the most efficient. This was deemed true because it had the highest area under the curve when compared to maximum Newton force and cost of production.

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