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COMPACT LIGHT-WEIGHT POLYMER COMPOSITE MATERIALS FOR RADIATION SHIELDING IN OUTER SPACE

Abstract

So called primary cosmic rays, high energy protons and atomic nuclei travelling at the speed of light through space, constitute a significant portion of dangers of space travel - as well as do the products of their collisions with the atmosphere or other matter, the secondary cosmic rays, which include many more different particles, such as muons, pions, neutrinos, and neutrons, but also protons and alpha particles, as well as X-rays. Especially in the light of longer distance advancements in space, such as the colonisation of Mars, radiation shielding becomes one of the consideration points of the highest importance. Particles such as protons or neutrons can be shielded by materials containing hydrogen, while photons in the X-ray or gamma-ray range need high-electron-density materials - such materials, built from light atoms like hydrogen and carbon, are the topic of this work. In order to combine shielding efforts as well as minimise secondary particle production inside the material various composite materials are being developed and used, mostly with polyethylene, lately also boron nitride and graphene addons. Gradient composite shielding material also serves for keeping the product compact and relatively light-weight, allowing for both architectural and textile usage cases. Importantly, early research stages suggest the possibility to use biocomposites, utilising microbes and microbe-derived products.