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CARBON NANOMATERIALS FOR ENERGY GENERATION TECHNOLOGIES IN SPACE EXPLORATION

Abstract

As an international community striving to explore further into the depths of space, the constant development and integration of new materials into various aspects of spaceflight is essential. Over the last two decades, the inclusion of carbon nanomaterials into developmental materials for the energy needs of the aerospace community has become routine. However, after spending the last five years researching fundamental issues in the development of graphene-based nanocomposites for thermoelectric technologies, it has become apparent that one key concern in the development of such materials is whether the improvement in material performance outweighs the current costs and manufacturing concerns for carbon nanomaterial-derived energetic materials. As we start a new decade of space exploration and research, it is essential to understand the current status and prospects of such materials in energy generation for space flight. This work provides an overview of this status, looking at new material technologies that utilize materials such as graphene, carbon nanotubes, and carbon nanofibers for the creation of next generation energy generation devices. This discussion will be supported in part by the ongoing research being conducted at NASA Langley Research Center and the University of Central Florida regarding the development of graphene-SiOC ceramic matrix nanocomposites for thermoelectric applications. Finally, a look into the prospects for the inclusion of carbon nanomaterials in energy generation materials over the next decade will be given.