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Myeong-Lok Seol, Jin-Woo Han, Dong-Il Moon,
M. Meyyappan



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Triboelectric Nanogenerator for Mars Environment

Myeong-Lok Seol, Jin-Woo Han, Dong-Il Moon, and M. Meyyappan*

Center for Nanotechnology, NASA Ames Research Center, Moffett Field, CA 94035, United States²

*Corresponding to jin-woo.han@nasa.gov

Abstract

Consistent and reliable power supply is critical for interplanetary exploration missions and habitats on Mars. Abundant wind, strong dust storms and surface vibrations on Mars are attractive mechanical sources to convert into electrical energy. Conventional electromagnetic generators are unsuitable for planetary exploration due to the heavy weight of permanent magnets and metal coils and high launch costs. Triboelectric nanogenerator (TENG) yielding high output power per mass is a potential alternative. The impact of Mars environment on triboelectricity generation is an unknown but critical issue, which is investigated here using a Mars analogue weather chamber. Individual and combined effects of environmental factors such as atmospheric pressure, atmospheric composition, temperature, ultraviolet and gamma radiations on the performance of TENG are analyzed. The potential of TENG for Mars exploration is addressed based on the experimental results and scientific implication.

Graphical abstract

Keywords

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