Nuclear Isomers Investigation and Direct Energy Conversion

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ABSTRACT:

The objective of this investigation is to determine materials for direct energy conversion within a power source created by the isomeric spin state of a designated nuclear isomer.

Excited states of nuclei can store five orders of magnitude more energy than that stored in chemical bonds. Essentially, the energy output would be nearly equivalent to nuclear fission, but without thermal neutron generation. Potential applications for this investigation involve extended duration power sources (i.e. "nuclear batteries" that could last more than one year in continuous use).

The experimentation involves examining the power conversion efficiencies of alpha, beta, and gamma radiation on radiation-hardened candidate materials. Several candidate materials, including silicon carbide and gallium nitride, are tested via irradiation processes and compared with non-hardened silicon. Following this investigation of power conversion materials is the engineering process for combining the nuclear isomer source and energy conversion into a package suitable for Army use. Envisioned are “nuclear batteries” to replace chemical batteries currently in use in the Army.

KEYWORDS: nuclear, isomers, radiation-hardened, silicon carbide,

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