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Mechanically Activated Metal Fuels for Energetic Material Applications

A novel manufacturing process combines metal and treated fluorocarbon particles to create solid propellants with increased reactivity, more stored energy, and enhanced ignition options for applications like rocketry, pyrotechnics, and explosives.

Composite solid propellants have uses in a variety of fields, such as rocketry, fireworks, and explosives. They are typically composed of a powered metal fuel, such as aluminum, and an oxidizer, such as ammonium nitrate, which serve to regulate the burning of the fuel.

Researchers at Purdue University have developed a novel manufacturing process and composition for improved solid propellants, pyrotechnics, and explosives. This technology combines tiny metal particles typically used in these fuels with treated fluorocarbon particles. A mechanical process causes the particles to mix and weld together without reacting increasing their reactivity with even more energy stored within the crystalline lattice structure created in the mixing process. Both properties combine to release substantially more energy from the fuel upon heating or combustion, as well as providing for an increased number of ignition options.

Advantages:

-Increased reactivity and more stored energy

-More energy upon heating or combustion

-Increased number of ignition options

Potential Applications:

-Propellants

-Pyrotechnics

-Explosives

TRL: 4

Technology ID
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Category
Aerospace & Defense/Hypersonics & Propulsion Systems
Aerospace & Defense/Thermal Management & Combustion Optimization
Materials Science & Nanotechnology/Advanced Functional Materials

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