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A Method for Encapsulation of Nanoparticles in Ionic Crystals

A novel method encapsulates performance-boosting nanomaterials within micron-sized particles, enabling safe handling and even dispersion while retaining enhanced material efficiency.

Previously, Purdue University researchers developed a process for preparing ultrafine ammonium perchlorate particles in which an aqueous solution of ammonium perchlorate was dispersed in an organic liquid for a water-in-oil emulsion. The emulsion is frozen and freeze dried to produce ultrafine particles. However, nanometric materials have not been widely accepted in some industries given their extremely small size presents significant challenges in such areas as handling, dispersion, safety, and ultimate strength.

Researchers at Purdue University have developed technology to mitigate these concerns by containing the nanomaterial inside micron-sized particles, allowing even dispersion and removing the influence of the nanoscale particle surface area on the polymeric binder, while still maintaining intimate contact between fuel and oxidizer particles. Therefore, this method retains the performance increase provided by nanoparticles. In addition, improved performance over current methods is expected as diffusional length scales for combustion will be decreased significantly, reducing the tendency for agglomeration and increasing efficiency.

Advantages:

-Alleviate concerns caused by agglomerate and high surface area

-Removes the influence of the nanoscale particle surface area on the polymeric binder

-Retain performance increase provided by nanoparticles

Potential Applications:

-Inclusion of nanoparticles in propellants

Technology ID

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Category

Chemicals & Advanced Materials/Polymer Science & Smart Materials

Aerospace & National Security/Hypersonics & Propulsion Systems

Materials Science & Nanotechnology/Nanomaterials & Nanostructures

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-Composite structures, cosmetics, pharmaceuticals, and energetic materials

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