

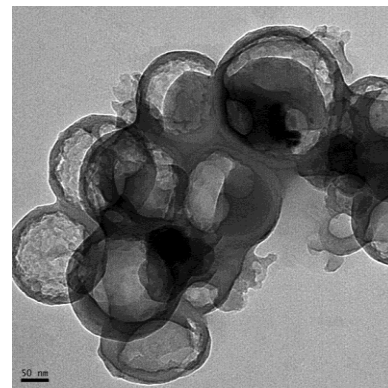
### Core-Shell Particles

Core-Shell nanoparticles are composite particles where a core material is coated with a material of a different composition (shell), imparting unique functionalities that are otherwise unattainable for the individual materials. Such nanostructured particles have diverse applications. NEI Corporation has recently developed a patent pending, scalable process to produce core-shell nanoparticles. The process can be used to manufacture metallic and ceramic core-shell nanoparticles, such as metal / metal oxide and metal / metal boride core-shell nanoparticles. The versatility of the process allows core-shell nanoparticles to be synthesized in a wide range of compositions.



#### Applications:

- Biomedical - in-vitro and deep tissue imaging
- LEDs, lasers, and phosphors
- Catalysis
- Solid propellants – launch vehicles, satellites, and missiles
- Energetic materials – airbags, drug injection, and micro-valves



Example of Core-Shell Nanoparticles  
Produced at NEI Corporation

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### Sulfide Nanomaterials

#### Lithium Tin Phosphorus Sulfide (LSPS)

Lithium Tin Phosphorus Sulfide (LSPS) is a “superionic” solid that conducts lithium ions at room temperature. The patent pending solid electrolyte is designed to eliminate flammability issues associated with currently used liquid electrolytes, while providing high ion conductivity. At room temperature, the electrolyte has high lithium-ion conductivity ( $\sim 10^{-3}$  S/cm) and can potentially be used in lithium-ion and lithium-sulfur rechargeable batteries. The processing methodology, which has been scaled to the kilogram level, can be adapted to other multi-element sulfide compositions.

Processes to produce tin (IV) sulfide ( $\text{SnS}_2$ ) nanoparticles ( $\sim 100$  nm), and micro-nano hybrid zinc sulfide (ZnS) particles, have also been developed at NEI.

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### Oxide Nanomaterials

#### Magnesium Oxide (MgO)

Magnesium oxide is commonly used as a grain growth inhibitor, desiccant, cement additive and an industrial cable insulator. Additional applications include visible and IR transparent windows, deacidification of at-risk paper items, protective coatings in plasma displays, and medicinal applications. We produce high surface area (specific surface area  $10\text{-}15$  m<sup>2</sup>/g, primary particle size  $\sim 150$  nm) magnesium oxide nanoparticles.

We also produce and supply nanoparticles of yttrium oxide (cubic  $\text{Y}_2\text{O}_3$ ), yttrium aluminum oxide (garnet,  $\text{Y}_3\text{Al}_5\text{O}_{12}$ ), and magnesium aluminum oxide (spinel  $\text{MgAl}_2\text{O}_4$ ).

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### High Surface Area Hollow Silica Fibers

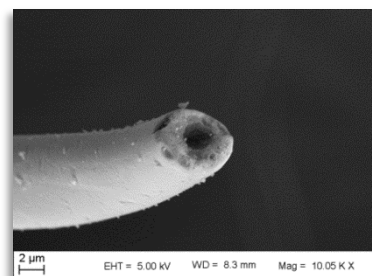
NANOMYTE® SuperSurf-C and SuperSurf-W are exceptionally high surface area, fibrous silica-based materials. Their nominal specific surface area (BET) is  $> 1000 \text{ m}^2/\text{g}$ . These materials are supplied in two forms: woven cloth (SuperSurf-C) and wool (SuperSurf-W). The fibers of these materials are hollow, which allows them to be infiltrated with other materials to achieve a desired functionality. The exceptionally high surface area of the fibers is due to the presence of nanoscale roughness and pores.



#### Applications:

- Base for filters to remove hazardous materials from water and air
- Antimicrobial textiles
- Thermal insulators
- Desiccants and sorbents

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### About NEI Corporation

NEI Corporation is an application driven company that utilizes nanotechnology to develop and produce advanced materials. The company's core competencies are in synthesizing nanoscale materials and prototyping products that incorporate the advanced materials. Founded in 1997, we manufacture and sell advanced materials products, provide materials development services, and perform contract-based R&D for public and private entities. NEI has built a strong manufacturing and R&D infrastructure that enables rapid transition of concepts to products.

NEI's products are sold under the registered trademark: **NANOMYTE®**.

NEI Corporation has a 10,000 square foot, state-of-the-art materials manufacturing and testing facility in Somerset, New Jersey. Highlights include high temperature furnaces with controlled atmospheres, mixing, blending and drying equipment, coaters, particle characterization instruments, corrosion testing equipment, polymer films & coatings characterization, and a Li-ion battery testing laboratory.

[MATCH: Materials Analysis, Testing, and Characterization ►►](#)

[TIPs: Transition Innovations to Products ►►](#)