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Solution-Based Synthesis of Copper-Arsenic-Chalcogen Derived Nanoparticles

A new, scalable process synthesizes thermoelectric nanoparticles using common, cost-effective materials, enhanced by a simple annealing step that improves electronic properties for various electronic and energy applications.

Thermoelectric materials have garnered much attention over the last several years due to their wide ranging applications and present stage of development. Currently, commercially available thermoelectric materials typically use rare and often times expensive elements in production, such as bismuth telluride. Thus, the cost associated with researching and producing the current standard for thermoelectric materials can be quite high. Another issue is the current method of improving the electronic properties of nanoparticle based film by increasing the grain size. The traditional hot press and spark plasma sintering technologies employed for increasing the grain size are of limited scalability, as a large amount of space and energy are needed for these techniques.

Researchers at Purdue University have developed a new process for the creation of nanoparticles with applications in thermoelectric materials as well as other electronic-related fields. This new process involves the synthesis of much more common and less expensive materials in the production of nanoparticles via a scalable method while maintaining purity throughout the procedure. Researchers have also developed a selenium annealing technique that is simple in design and extremely effective in improving the electronic properties of the new material. Both methods provide a new, more efficient avenue for a wide range of material development in thermoelectronics and other fields.

Advantages:

-Nanoparticles produced with more common inputs

-Simple annealing step improves electronic properties

Potential Applications:

Technology ID

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Category

Semiconductors/Devices & Components
Materials Science & Nanotechnology/Nanomaterials & Nanostructures
Materials Science & Nanotechnology/Thermal Management Materials & Solutions

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-Photovoltaics

-Thermoelectric conversion

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