Synthesis of Multinary Chalcogenide Nanoparticles Comprising of Cu, Zn, Sn, S, and Se

A novel synthesis method produces highly abundant and low-toxicity multinary chalcogenide nanoparticles for cost-effective, comparable-efficiency thin films in photovoltaic applications.

Among the various semiconductor nanomaterials investigated for photovoltaic applications, the most promising candidate for low cost solar cells is the I-III-VI2 family of chalcopyrite nanocrystals. However, due to the limited supply and ever increasing price of rare metals, such as indium and gallium, there is a need to find alternative materials with high abundance and low cost.

Researchers at Purdue University have developed an innovative method that is related to the synthesis of multinary chalcogenide nanoparticles comprising of Cu, Zn, Sn, S, and Se. The main compound created is Cu2ZnSn(SySe1-y)4, whereby Cu/(Zn+Sn) can be substantially less than 1, but greater than 0.5; Zn/Sn can be greater than, equal to, or less than 1; and y can be between 0 and 1. This method would allow for improved thin films for photovoltaic applications because of tin and zinc's natural abundance in the earth's crust and the relatively low toxicity.

Advantages:

-Cost-effective

-Comparable efficiency

-High abundance and low toxicity of inputs

Potential Applications:

-Green technology

-Photovoltaic technologies

TRL: 4

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Category
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Materials Science & Nanotechnology/Nanomaterials & Nanostructures
GreenTech/Environmental Remediation & Pollution Control

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