Tentative Outline

Special Thematic Issue for the journal Recent Patents on Nanotechnology

Antimony chalcogenides, a new commer for solar cells

Section Editor: Dr. Jianmin Li

- **Scope of the Thematic Issue:**

Antimony chalcogenides (Sb2(SxSe1-x)3) has become an exceptionally appealing light absorber for solar cells in recent years due to its environmental friendliness, excellent light absorption in the visible range (light absorption coefficient ~ 1.8 × 105 cm-1) and suitable bandgap (1.1-1.7 eV). According to Shockley-Queisser's theory, the maximum power conversion efficiency (PCE) of Sb2(SxSe1-x)3 solar cells can reach up to over 30%. However, the device's efficiency has fallen far short of expectations. In terms of defect suppression and PCE improvement, the material processing method plays an inextricable role. Over the years, a lot of efforts have been made in developing film deposition techniques for Sb2(SxSe1-x)3 absorbers, including hydrothermal (HT), chemical bath deposition (CBD), fast chemical approach (FCA), vapor transport deposition (VTD), thermal evaporation (TE), rapid thermal evaporation (RTE), atomic layer deposition (ALD), and closed space sublimation (CSS). Nonetheless, the PCE and functionalities' understanding of Sb2(SxSe1-x)3 films as well as based solar cells are still far less than that of the other well-established chalcogenide-based solar cells such as Cu(In,Ga)Se2 (CIGS) and CdTe. Therefore, further improving the PCE of Sb2(SxSe1-x)3 thin-film solar cells and delving deeper into its functionalities are urgent tasks in the future.

Keywords:
Sb2(SxSe1-x)3，Sb2S3, Sb2Se3, composition engineering, defects engineering, crystal orientation effects, additives engineering, synthetic methodology, double electron transport layer, hole transport layer, all-inorganic.

Sub-topics:

The sub-topics to be covered within the issue should be provided:

· Understanding of defects formation in Sb2(SxSe1-x)3 materials;

· Design and optimization of crystal orientation in Sb2(SxSe1-x)3 materials;

· Design new structure for Sb2(SxSe1-x) 3-based solar cells;

· New inorganic hole transport materials;

· Strategies for preparation of high-efficiency Sb2(SxSe1-x)3 solar cells.

Tentative titles of the articles:

1. Hydrothermal approach for high-efficiency Sb-based solar cells.

2. Design and optimization of crystal orientation in Sb2Se3 materials.

3. In-suit method to control the growth of Sb2Se3.

4. IVD for Sb2Se3 solar cells

5. Double electron transport layer for high-efficiency Sb-based solar cells

6. Defects in Antimony chalcogenides

7. Post-treatment for high efficiency pure Sb2S3 solar cells.

8. VTD for high-efficiency Sb-based solar cells.

9. All inorganic HTLs for high-efficiency solar cells.

Schedule:

Thematic issue submission deadline: 31st March 2023.

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