Tin-sulfur solar cells

Can tin (II) monosulfide be used for thin film solar cells?
Research groups around the world are investigatingtin (II) monosulfide (SnS) via various deposition methods and heterostructures for thin film solar cells. The maximum achieved efficiency has yet to reach 5% despite the promising properties of SnS.

Are tin & sulfur a good material for solar energy?
Tin and sulfur are also both environmentally benign elements which are cheap and abundant in nature. SnS has an ideal bandgap for solar absorption(1.3 eV for bulk),a high absorbance coefficient >10 -4 cm -1,Hall mobility up to 100 cm 2 Vs -1 or higher,and tuneable carrier densities in the range of 10 15 to 10 18 cm -3 [5,6,7].

Is tin a p-type solar cell absorber?
The upstream processing of tin and sulfur is lower energy than CdTe or Cu (In,Ga) (S,Se) 2 (CIGS). They have low toxicity,with no heavy metals,and could easily become part of the supply chain for photovoltaic applications,like silicon has. SnS is natively p-typewith ideal parameters for a solar cell absorber.

Can sulfur be used as an absorber layer in a thin-film solar cell?
Recent research shows that the replacement of Sulfur (S) by Selenium (Se) can reduce its band gap to 1 eV (100% replacement of S) . These natural characteristics of the material are very encouragingto use as an absorber layer in the thin-film solar cell.

What is tin sulfide?
Introduction Tin sulfide fits into two areas of research interest including metal sulfides, and the search for new photovoltaic (PV) absorber materials. Through extension of the knowledge of tin sulfide, improved understanding of metal sulfides is possible.

What is a thin-film solar cell?
Thin-film solar cell is considered the second generation of solar cellsdue to polycrystalline/hetero-junction structure [90,91]. In CZTS thin-film solar cells,the CZTS layer acts as a p-type region. Absorption of light by CZTS material creates electron-hole pairs,which get separated by the junction electric field.

Solar cells made from copper zinc tin sulfide (CZTS) have gained popularity as a possible low-cost and Earth-abundant alternative to copper indium gallium selenide (CIGS) cells. This is because, unlike the Group 13 elements indium and gallium in CIGS, Zn and Sn are both Earth-abundant and relatively harmless for human health and ...

To obtain high photovoltaic performances for the emerging copper zinc tin sulfide/selenide (CZTSSe) thin film solar cells, much effort has deservedly been placed on CZTSSe phase purification...

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Typically, copper-zinc-tin-sulfur-selenium (CZTSSe) solar cells have become a potential competitor among the new generation thin-film cells, due to their excellent photoelectric properties and low-cost, plentiful raw material resources. In this review we will focus on CZTSSe solar cells and describe the principle of their operation ...

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The constituents of this semiconductor, copper, zinc, tin and sulfur, have the advantages of being both abundant in the earth"s crust and non-toxic. CZTS also has near ideal properties for solar photovoltaics, as it is a very strong absorber and has a band gap of around 1.4eV.

Tin(II) sulfide is a promising material for absorber layers in thin film solar cells. Noguchi et al. developed one of the first solar cells with a significant power conversion efficiency based on evaporation of SnS into an indium doped tin oxide (ITO)/n-CdS/p-SnS/Ag heterostructure. The cell had a short circuit current of 7 mA cm

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Given its preeminent photovoltaic properties, tin sulfide (SnS) has attracted remarkable interest and has been explored as an absorber for thin-film solar cells in the last few decades. However, the power conversion efficiency (PCE) of SnS-based solar cells is ...

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