Name of the Technology: Colloidal Multicomponent CZTSSe Inks for Solar Cells

Summary: An ideal thin-film solar cell absorber material should have a direct band gap around 1.3–1.5 eV with abundant, inexpensive, and non-toxic elements. Cu(InGa)Se$_2$ (CIGS) is one of the most promising thin-film solar cell materials, demonstrating an efficiency of about 23%. However, In and Ga are expensive components, and the band gap is usually not optimal for high efficiency CIGS solar cells. CZTSe/CZTS is an alternative for the replacement of expensive & scarce element, viz. Indium in CIGSe by much cheaper & earth-abundant elements (Zinc & Tin) as it replaces half of the indium atoms by Zn and the other half by Sn. However, multicomponent (CZTSSe) chalcopyrite-based materials developed at CSIR-NPL using non-vacuum process combine benefits from the presence of both sulphur and selenium, wherein individual CZTS & CZTSe, certain limitations do exist. Our inks can be easily be deposited by spraying, printing, dip coating over large area substrates.

Applications: These inks can be used as absorber layer in thin-film solar cells and also as photocathodes in Dye Sensitized Solar Cells (DSSCs).

Specifications: Particle sizes ≤200 nm; High (3-5 yrs) Shelf Life; Optimal band gap: ~1.4-1.5 eV; Zn & Se-rich and Cu-poor; Coating possible on rigid (glass) and flexible substrates; High wettability (contact angle <90°)
**Advantages:** Our inks are aqueous-free and contain no hydrazine and other toxic solvents that are not environmentally friendly. Coating of our inks is possible on flexible substrates due to low processing temperature (<450°C), which can prevent degassing, curling and deformation of the substrate.

**Choose the Readiness level of the Technology:**

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**Related Patents:** Patent No: **Know-how,** Country: **Not applicable,** Publication Date: **Not applicable;** Grant Date: **Nil;** **Year of Introduction:** 2018

**Broad Area/Category:** Clean Technologies

**User Industries:** Academic institutes, universities and solar cell companies who carry out R & D activities on photovoltaics.

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