

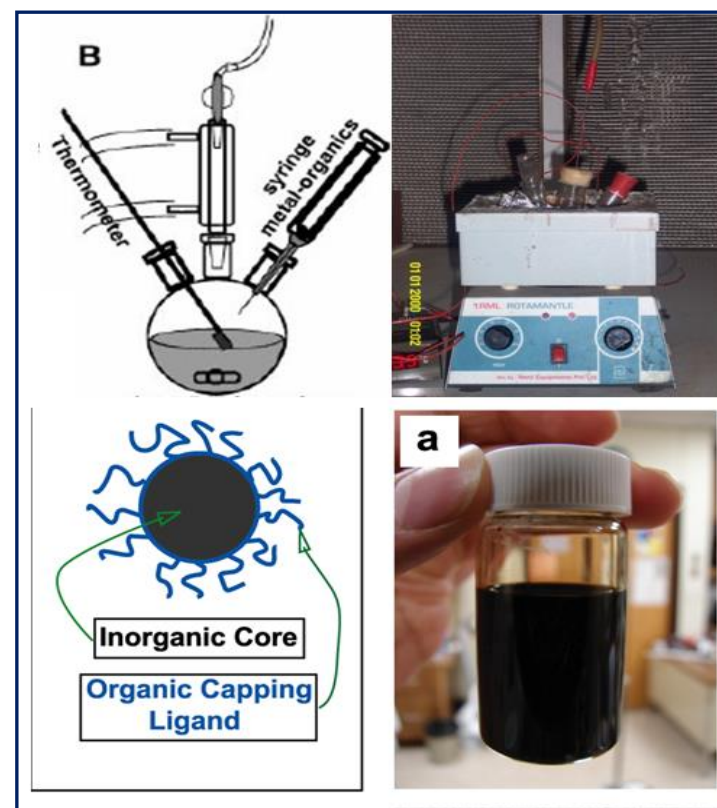


Name of the Technology: Colloidal Multicomponent CZTSSe Inks for Solar Cells

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. $\text{Cu}(\text{InGa})\text{Se}_2$ (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 $< 90^\circ$)





Advantages: Our inks are aqueous-free and contain no hydrazine and other toxic solvents that are not environmental 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:

Idea	Concept Definition	Proof of Concept	Prototype	Lab Validation	Technology Development	Technology Demonstration	Technology Integrated	Market Launch

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.