

Comparative study between CZTS_{1-x}Se_x and ABX₃ based solar cells

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CZTS_{1-x}Se_x and ABX₃ (where A = CH₃NH₃⁺, HC (NH₂)₂⁺, CS⁺, Rb⁺; B = Pb²⁺, Sn²⁺, Sb²⁺; X = Cl, Br⁻, or I⁻), have received much attention from the scientific community as light absorbing semiconductor materials. Their high absorption coefficient makes them very attractive for solar cells applications [1,2].

The general structure of the solar cells has the following sequence: the transparent conducting oxide (TCO - fluorine-doped tin oxide: FTO or indium tin oxide: ITO) / the electron transport layer (ETL) / the absorber layer (CZTS_{1-x}Se_x or ABX₃) / the hole transporting layer (HTL) / the metal electrode.

In this work, we present a comparative study between solar cells using CZTS_{1-x}Se_x and ABX₃ as absorber layer. The surface morphology, structure, optical properties, and the current density–voltage (J–V) curves were investigated by Atomic force microscopy (AFM), X-ray diffraction (XRD), spectroscopic ellipsometry, photoluminescence spectroscopy, electrical stands, and solar simulator under AM 1.5 G irradiation at 100 mW/cm², respectively.

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References

- [1] Kojima *et al.*, Organometal halide perovskites as visible- light sensitizers for photovoltaic cells, *J. Am. Chem. Soc.* 131 (2009) 6050.
- [2] Franckevičius *et al.*, Efficiency improvement of superstrate CZTSSe solar cells processed by spray pyrolysis approach, *Sol. Energ.* 185 (2019) 283.