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Band-gap alteration of Zn_2SnO_4 nanostructures for optical and photo-luminescent applications

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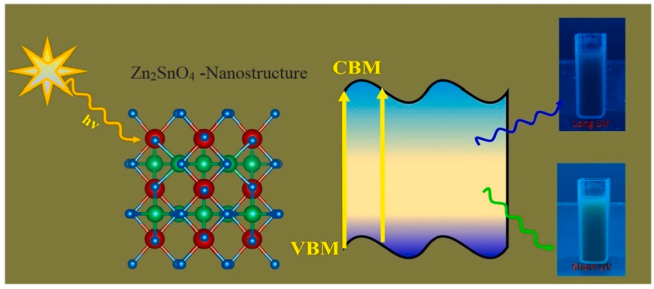
HIGHLIGHTS

- Hydrothermal synthesis of Pristine and Cu doped Zn_2SnO_4 nanostructures under subcritical conditions.
- Band-gap reduction up to 2.5 eV upon 10% Cu doping is achieved.
- 10% Cu doped Zn_2SnO_4 shows the blue shift due to the Moss-Burstein Effect.
- Theoretical modelling of electronic structure replicates the experimental data precisely.

GRAPHICAL ABSTRACT



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ABSTRACT

Present manuscript reports the hydrothermal synthesis of pristine (Zn_2SnO_4) and copper doped Zn_2SnO_4 spinals under subcritical conditions. XRD pattern identifies the cubic phase of pristine and its doped nanostructures. Tauc plot and density functional theory (DFT) studies claim the lowering of band gap values up to 2.5 eV upon the insertion of transition metal copper (Cu) into the host lattice. Blue shift occurs due to Moss−Burstein effect upon excess concentration of Copper is realized. Both pristine and Cu doped Zn_2SnO_4 present light green and dark blue colour upon the irradiation of different UV (252 nm and 365 nm) lamps, respectively. Besides this, Zn_2SnO_4 shows effectiveness in hosting Cu ions, thus could act as a prospective green/blue emitter.

1. Introduction

The chemistry of spinals has rationalized the world because of its emerging application in the field of material science and modern technology. From the past few decades, metal oxides are considered to be the prime candidate for the development of solar cells [1,2]. Generally, two

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