Enhanced field emission from indium (III) selenide nano-cubes synthesized by laser ablation in liquid

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The research world for two dimensional (2D) materials is speeding day by day because of their excellent electronic, optical and optoelectronic properties. Among these 2D materials, indium III selenide (In_2Se_3) is performing excellently in the field of electronics, optics, and optoelectronics. In this work, we synthesized the 70 nm average particle sized In_2Se_3 nanocubes using laser ablation in water. For laser ablation, Nd: YAG laser is used as the laser source having 532 nm of wavelength with 62 mJ pulse and 10 Hz of repetition rate. The laser with power of 620 mW was targeted on 1 hour sonicated 20 mg α-In_2Se_3 in 20 ml double distilled

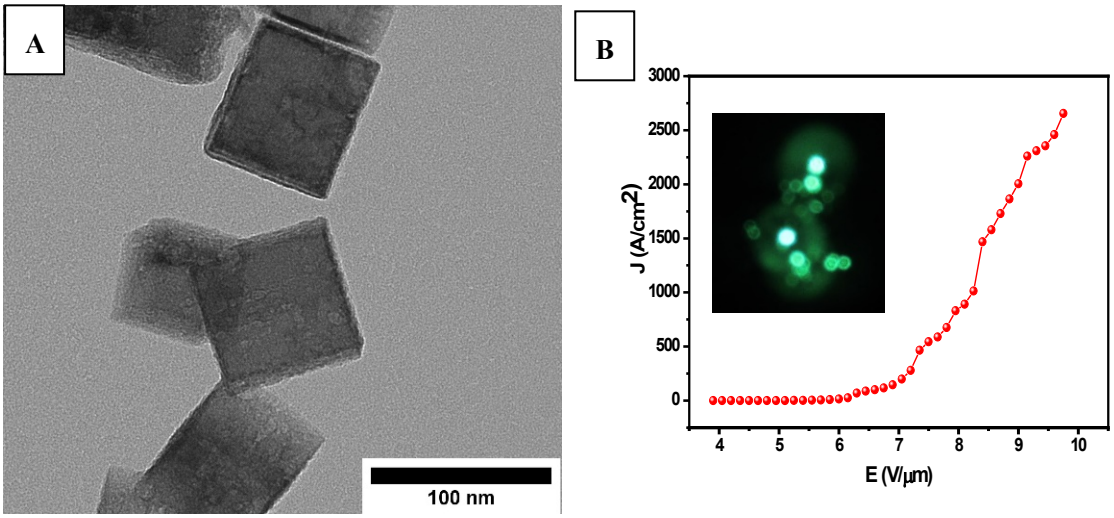

Figure 1(A) TEM image of In_2Se_3 nanocubes. (B) Field electron emission characteristics of In_2Se_3

de-ionized water. The α-phase of In_2Se_3 is unchanged even after laser ablation. The In_2Se_3 nanocubes having size about 70 nm shows the superior field emission behavior. The field electron emission maximum current density ~2.656 mA/cm^2 at field of 9.7 V/μm is achieved along with stable emission for 5 hours. We have also studied the electron decay analysis within the cubic structure using ultrafast transient absorption spectroscopy (UTAS) for better understanding of carrier dynamics.

Key words: Indium (III) selenide, 2D Materials, Field emission, Laser ablation in liquid, Ultrafast transient absorption spectroscopy, field emission.