

Synthesis and Characterization of Cobalt Selenide Nanoparticles and Assessment of its Photocatalytic Activity

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Abstract—Here we report the synthesis, characterization, and photocatalytic studies of cobalt selenide (CoSe) nanoparticles (NPs). Synthesized CoSe NPs were characterized using transmission electron microscopy and X-ray diffraction, which showed that the NPs are highly crystalline, circular and having particle size of 20-25 nm in diameter. Furthermore, structural, optical, thermal and photocatalytic properties of the synthesized CoSe NPs were also evaluated. The TGA/DTA results revealed that the Co and Se are strongly interacting, which is also supported by the selective area EDAX analysis. We have applied the synthesized CoSe NPs for an efficient photocatalysis of Rhodamine B (RhB) dye under UV light irradiation, which resulted in the productions of reactive oxygen species (ROS) by the CoSe NPs. Based upon the present results, we conclude that the synthesized CoSe NPs have great environmental significance. Moreover, the energy band gap as calculated by the Tauc relation was found to be in the range of $E_g=1.8$ eV.

Keywords: Cobalt selenide nanoparticles, rhodamine B dye, photocatalysis, reactive oxygen species.