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# Low temperature synthesis of iron pyrite (FeS<sub>2</sub>) nanospheres as a strong solar absorber material

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**Abstract:** Phase pure iron pyrite (FeS<sub>2</sub>) nanosphere morphology was synthesized by a solvothermal route an alternative to colloidal synthesis by utilizing an ethylene glycol and benzylamine as a solvent and structure directing ligand at 160°C for 12h in Teflon lined autoclave. The as obtained nanospheres were in average ~50 nm diameter with a smooth surface and well mono-disperse as observed by the FESEM images. The XRD analysis shows a typical iron pyrite crystal phase with 2 $\theta$  position at 28.23°, 32.76°, 36.84°, 40.48°, 47.32° and 56.01° without any impurity peaks. The Raman spectra further confirmed the phase pure pyrite structure. The UV-Vis and PL spectra shows excellent solar absorbance with a band gaps of 1.35 eV close to the direct band gap (1.38 eV) of pyrite materials, however the photoluminescence spectra shows a band gap of 1.39 eV close to the direct band gap. The obtained nanosphere morphology was highly promising as an excellent solar absorber material for the photovoltaic application.

**Keywords:** Colloidal processing, Optical materials and properties, Raman, Fool's gold, Photovoltaics, Photoluminescence

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## 1. Introduction

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