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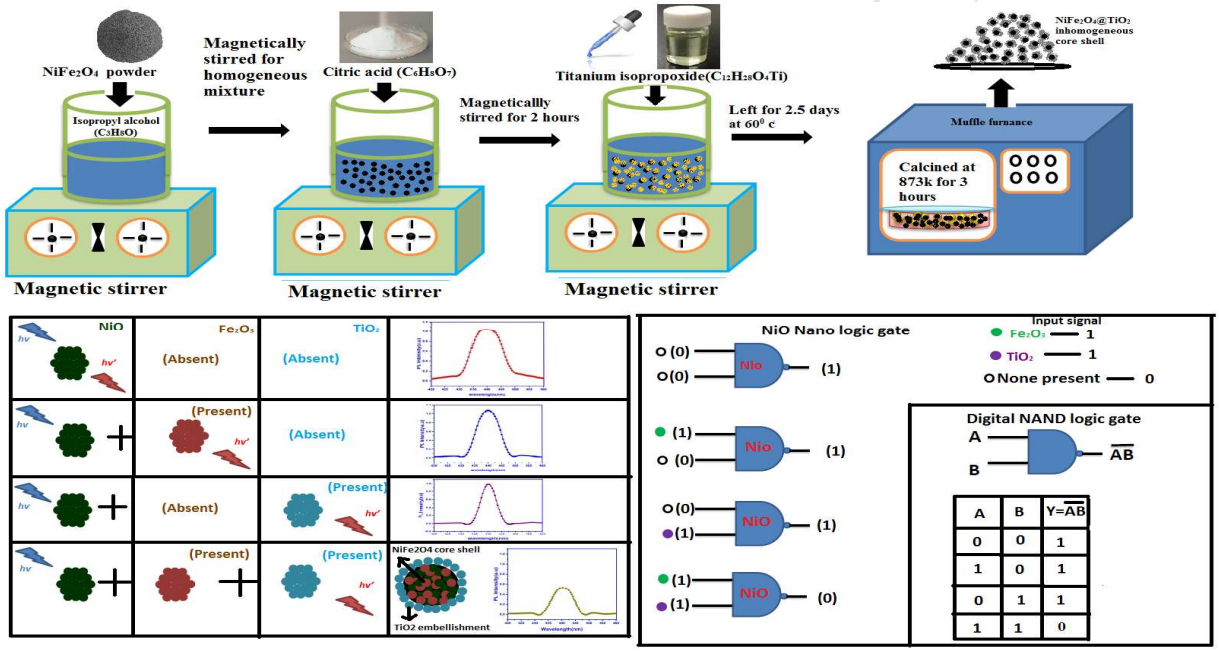

Abstract

This study reports on the construction of nano nickel ferrite NAND logic gate utilizing the concept of fluorescence quenching mechanism due to its possible applications for the TiO_2 sensor. Sol-gel auto combustion route and two-step synthesis procedures were adopted for synthesis and characterization of NiO, $NiTiO_3$, $NiFe_2O_4$, and novel magnetic core-shell $NiFe_2O_4@TiO_2$.The high crystalline phase formation, surface morphology and identical particle size formation (23-32nm) were confirmed from XRD, SEM and W-H plot respectively. The TEM micrographs of core-shell $NiFe_2O_4@TiO_2$ revels the inhomogeneous cages of TiO_2 and unsymmetrical boundary around the magnetic $NiFe_2O_4$ core. The optical band gap (determined from UV-DRS spectra using Kubelka-Munk equation) decreases significantly from NiO (3.94 eV) to $NiFe_2O_4@TiO_2$(1.84 eV) indicates enhanced semiconducting nature. The FTIR-ATR spectra spotlighted on the relaxation of the intrinsic metallic [$Ni_{(octa/tetra)}$-O] stretching vibrations from NiO to $NiFe_2O_4@TiO_2$ core-shell. The quenching intensity of photoluminescence (PL)