

## **Title: Synthesis and characterization of Boron doped Titanium (IV) oxide nanocomposites**

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**Abstract:** TiO<sub>2</sub> nanoparticles with different amount of boron were synthesized using a combination of green and impregnation-assisted method. The influence of solution pH (3-12) and calcination temperature (200-700 °C) on the morphology and size of the nanomaterials were investigated. The as-synthesized TiO<sub>2</sub> and Boron doped TiO<sub>2</sub> were characterized by several analytical techniques such as High Resolution Electron Microscope (HRTEM), UV-Visible spectroscopy, X-Ray Diffraction (XRD) and X-Ray Photoelectron Spectroscopy (XPS). The HRSEM/HRTEM micrograph revealed the formation of densely packed agglomerated spherical particles with an average size of 10 nm at pH 3. The XRD results confirmed the formation of pure anatase phase of TiO<sub>2</sub> and addition of boron did not cause phase transformation to either rutile or brookite. The incorporation of boron to the lattice layer of TiO<sub>2</sub> was responsible for the reduction of band gap from 3.0 eV to 2.4 eV. The XPS analysis showed the interstitial and substitutional effect of O in the lattice layer of TiO<sub>2</sub> by B and established existence of B-Ti-O bond. This study demonstrated that the optimum conditions to obtain pure anatase phase boron doped TiO<sub>2</sub> nanocomposites were solution pH (3), calcination temperature (400 °C) and boron concentration (0.1 M).

**Keywords:** Synthesis, TiO<sub>2</sub> nanoparticles, boron doping, characterization.