

## Synthesis and Characterization of TiO<sub>2</sub>, N Doped TiO<sub>2</sub> and AG Doped TiO<sub>2</sub> for Photocatalytic Degradation of Methylene Blue in Adwa Almeda Textile Industry, Tigray, Ethiopia

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**Abstract :** Nowadays, the photocatalytic mechanism of water purification using nanoparticles has gained wider acceptance. For this purpose, the crystal form of N-TiO<sub>2</sub> and Ag-TiO<sub>2</sub> was prepared from TiCl<sub>4</sub>, urea, NH<sub>4</sub>OH, and AgNO<sub>3</sub> by sol-gel method and simple solid phase reaction followed by calcination at a temperature of 400°C for 4h at each. The synthesized photocatalysts were characterized using XRD, SEM, and UV-visible diffuse reflectance spectra. In the experiment, it was found that the absorption edge of N-TiO<sub>2</sub> was an efficient shift to visible light as compared to Ag-TiO<sub>2</sub>. The XRD diffraction makes the particle size of N-TiO<sub>2</sub> smaller than Ag-TiO<sub>2</sub>. The effect of catalyst loading and the effect of temperature on the photocatalytic efficiency of the prepared samples was tested using methylene blue as a target pollutant. The photocatalytic degradation efficiency of the catalysts for methylene blue was increased from 57.05 to 96.02% under solar radiation as the amount of the catalyst increased from 0.15 to 0.45 gram for N-TiO<sub>2</sub>. Similarly, photocatalytic degradation of methylene blue was increased from 40.32 to 81.21% as the amount of Ag-TiO<sub>2</sub> increased from 0.05g to 0.1g. In addition, the photocatalytic degradation efficiency of the catalysts for the removal of methylene blue was increased from 58.00 to 98.00 and 47.00 to 81.21% under solar radiation as the calcination temperature of the catalyst increased from 300 to 500 for N-TiO<sub>2</sub> for Ag-TiO<sub>2</sub> 300 to 400°C. However, a further increase in catalyst loading and calcination temperature was found to decrease the degradation efficiency.

**Keywords :** photocatalysis, degradation, nanoparticles, catalyst loading, calcination, methylene blue

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