

## Kinetic Study of $C_3N_4/CuWO_4$ : Photocatalyst towards Solar Light Inactivation of Mixed Populated Bacteria

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**Abstract :** Microbial contamination is one of the major concerns in the field of water treatment. AOP (advanced oxidation processes) is well-established method to resolve the issue of removal of contaminants in water. A Z-scheme composite  $g-C_3N_4/CuWO_4$  was synthesized by sol-gel method for the photocatalytic inactivation of a mixed population of Gram-positive bacteria (*S. aureus*) and Gram-negative bacteria (*E. coli*). The photoinactivation was observed for different types of bacteria in the same medium together and individually in the absence of the nutrients. The lattice structures and phase purities were determined by X-ray diffraction. For morphological and topographical features, scanning electron microscopy and transmission electron microscopy analyses were carried out. The band edges of the semiconductor (valence band and conduction band) were determined by ultraviolet photoelectron microscopy. The lifetime of the charge carriers and band gap of the semiconductors were determined by time resolved fluorescence spectroscopy and diffused reflectance spectroscopy, respectively. The effect of weight ratio of  $C_3N_4$  and  $CuWO_4$  was observed by performing photocatalytic experiments. To investigate the exact mechanism and major responsible radicals for photocatalysis, scavenger studies were performed. The rate constants and order of the inactivation reactions were obtained by power law kinetics. For *E. coli* and *S. aureus*, the order of reaction and rate constants are 1.15, 0.9 and  $1.39 \pm 0.03$  (CFU/mL) $^{-0.15} h^{-1}$ ,  $47.95 \pm 1.2$  (CFU/mL) $^{0.1} h^{-1}$ , respectively.

**Keywords :** z-scheme, *E. coli*, *S. aureus*, sol-gel

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