PERSULFATE ACTIVATION FOR VANCOMYCIN DEGRADATION USING HETEROATOM-DOPED GRAPHENE OXIDE

M. Khaleghiabbasabadi, D. Silvestri, V. Leová, M. Černík, S. Wacławek

Technical University of Liberec, Liberec, CZ

Abstract: Growing concerns over the presence of pollutants in water have prompted the scientific community to explore innovative remediation techniques such as those based on radical reactions. Among oxidative treatments, sulfate-based processes have garnered significant interest due to their versatility. However, the need for catalysts or activation methods complicates their application. In this context, carbon materials are increasingly used in advanced oxidation systems. Yet, the fabrication of carbon nanomaterials, such as graphene oxide, remains a complex process that requires numerous chemicals and sophisticated setups. To address these challenges and promote a more environmentally friendly production approach, we synthesized phosphorus-doped graphene oxide (PGO) through the electrochemical exfoliation of graphite. Various analytical techniques, including scanning electron microscopy (SEM), Raman spectroscopy, and energy dispersive X-ray (EDX), were used to confirm the composition and structure of PGO.

PGO was then tested for persulfate activation to degrade vancomycin (VAN). The results showed that the VAN concentration reached the under-detection limit in only 5 minutes at neutral pH and room temperature (PGO 50 mg/L, VAN 10 mg/L, volume 50 mL) outperforming undoped GO.

Keywords: Oxidative treatments sulfate-based processes, phosphor-doped graphene oxide (PGO), Persulfate (PDS), Degradation of Vancomycin