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Enhancing the catalytic activity of g-C₃N₄ through Me doping (Me = Cu, Co and Fe) for selective sulfathiazole degradation *via* redox-based advanced oxidation process

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Abstract: In this study, Me-doped g-C₃N₄ (Me = Cu, Co and Fe) catalysts with various % w/w of Me dopant are prepared by a versatile calcination protocol for catalytic redox-based advanced oxidation process. The characterization study using FESEM, EDX, TEM, XRD, TGA, XPS, FTIR and BET indicates that all the Me-doped g-C₃N₄ consist of irregular morphology with at least 1.4–1.9 times higher surface area than that of pristine g-C₃N₄. The catalysts were used to generate SO₄^{•-} from peroxymonosulfate (PMS) for selective sulfathiazole (STZ) degradation. The results show that the catalytic activities of the Me-doped g-C₃N₄ are in the following order: Co-doped g-C₃N₄ (0.59% w/w Co, Co-g-4) > Fe-doped g-C₃N₄ > Cu-doped g-C₃N₄ ~ pristine g-C₃N₄. The excessive Me doping have a negative effect on catalytic performance due to the undesired SO₄^{•-} scavenging by surface defects (–C≡N) and excess Me. The STZ degradation were highly influenced by the pH, catalyst loading and Oxone[®] dosage. The predominant reactive radical is identified to be SO₄^{•-} which contributes to >82% of total STZ degradation. The LC/MS/MS system was used to confirm the selectivity of SO₄^{•-} for STZ degradation. The main STZ degradation pathway is also proposed. The performance of Co-g-4/PMS system for STZ removal in the treated drinking water (TW) and secondary wastewater effluent (SE) was investigated. It is found that, despite having poorer performance compared with the DI water due to the presence of various water matrix species particularly the dissolved organic matter, the

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