Enhancing the catalytic activity of g–C_3N_4 through Me doping (Me = Cu, Co and Fe) for selective sulfathiazole degradation *via* redox–based advanced oxidation process

Wen-Da Oh, Victor W.C. Chang, Zhong-Ting Hu, Ronn Goei, Teik-Thye Lim

PII: S1385-8947(17)30651-4
DOI: http://dx.doi.org/10.1016/j.cej.2017.04.107
Reference: CEJ 16861

To appear in: *Chemical Engineering Journal*

Received Date: 2 March 2017
Revised Date: 22 April 2017
Accepted Date: 24 April 2017

Please cite this article as: W-D. Oh, V.W.C. Chang, Z-T. Hu, R. Goei, T-T. Lim, Enhancing the catalytic activity of g–C_3N_4 through Me doping (Me = Cu, Co and Fe) for selective sulfathiazole degradation *via* redox–based advanced oxidation process, *Chemical Engineering Journal* (2017), doi: http://dx.doi.org/10.1016/j.cej.2017.04.107

Enhancing the catalytic activity of g–C_3N_4 through Me doping (Me = Cu, Co and Fe) for selective sulfathiazole degradation *via* redox–based advanced oxidation process

Wen–Da Oh[a]*, Victor W.C. Chang[a], Zhong–Ting Hu[b], Ronn Goei[a], Teik–Thye Lim[a, b]*

[a]Nanyang Environment and Water Research Institute (NEWRI), Nanyang Technological University, 1 Cleantech Loop, CleanTech One, Singapore 637141, Singapore.

[b]Division of Environmental and Water Resources Engineering, School of Civil and Environmental Engineering, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798, Singapore.

Abstract: In this study, Me−doped g−C_3N_4 (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−C_3N_4 consist of irregular morphology with at least 1.4−1.9 times higher surface area than that of pristine g−C_3N_4. The catalysts were used to generate $SO_4^{\bullet-}$ from peroxymonosulfate (PMS) for selective sulfathiazole (STZ) degradation. The results show that the catalytic activities of the Me−doped g−C_3N_4 are in the following order: Co−doped g−C_3N_4 (0.59% w/w Co, Co−g−4)>Fe−doped g−C_3N_4>>Cu−doped g−C_3N_4~pristine g−C_3N_4. The excessive Me doping have a negative effect on catalytic performance due to the undesired $SO_4^{\bullet-}$ 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 $SO_4^{\bullet-}$ which contributes to >82% of total STZ degradation. The LC/MS/MS system was used to confirm the selectivity of $SO_4^{\bullet-}$ 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