

Elimination of Contaminants of Emerging Concerns by Peracetic Acid and Advanced Oxidation Process

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Abstract : The removal of the selected contaminants of emerging concerns (CECs) presented under related environmental conditions by Peracetic Acid (PAA) and PAA-UV photolysis processes was examined in this study. A mixture of (CECs) (pesticides and pharmaceutical compounds) was prepared in clean water and treated with different doses of PAA (3.2, 6.4, and 9.6 mg/L) under different pH values (5.2, 7.2, and 9.2). The results revealed that the reactivity of the selected CECs with PAA was classified into three groups: Group 1 poorly reactive (removal <25%), Group 2 moderately reactive (removal 25% to 50%), and Group 3 highly reactive (> 50%). Group 1 includes atrazine (ATZ) and fluconazole (FCL), Group 2 includes carbamazepine (CBZ), sulfamethoxazole (SMX), trimethoprim (TMP), mecoprop (MCP), diazinon (DZN) and Group 3 includes perfluorooctanoic acid (PFOA) and clindamycin (CLN). The pH was found to affect the CECs' degradation differently, for Group 1 and Group 3, better removal was achieved in the acid and alkaline medium. In contrast, for Group 2 pH effects were not well pronounced. PAA-UV photolysis processes were explored to degrade the recalcitrant indicator compounds: ATZ (Group 1) and SMX (Group 2). PAA-UV process showed no improvement in the removal of ATZ. In contrast, PAA-UV removed SMX drastically with a pseudo decay rate constant of 0.014 cm²/mJ compared to 0.002 cm²/mJ by UV alone. The contribution of hydroxyl radical to the degradation process using the PAA-UV process was found to be negligible. This study illustrated PAA's capability on the degradation of the CECs presented in relative environmental conditions and unveiled the potential of using PAA-UV processes as advanced oxidation processes.

Keywords : advanced oxidation process, contaminants of emerging concerns, peracetic acid, hydroxyl radical

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