

Comparative evaluation of oxidation efficiency of UV/H₂O₂ and UV/Chlorine AOP with fluorescence spectroscopy

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Abstract

With the rapid development of water quality analysis technology, endocrine disruptors (ECDs) such as residual pharmaceuticals including antibiotics are continuously detected from the drinking water sources of Korea which are mostly rivers. Due to the recent abnormal climate, the average temperature of river and lake water has been increased, and substances having taste and odours because of algae are detected even in winter. As a result, civil complaints are increasing due to the unsatisfied problem related with taste and odour compounds. Since it is impossible to effectively remove emerging contaminants such as substance having taste or odour, residual pharmaceuticals, non-biodegradable materials including flame retardant materials, and chlorine-resistant pathogenic microorganisms through conventional water treatment processes, various advanced oxidation technologies are introduced to overcome the technical limitations that the conventional drinking water system has. Advanced oxidation technology (AOP) refers to the technologies of removing hazardous substances by using OH radicals. The treatment efficiency becomes higher, as more OH radicals are generated. In this study, with UV/H₂O₂ and UV/Chlorine technologies of a laboratory scale and a full scale, the organic substance removing characteristics and efficiencies of the AOPs were compared and evaluated depending on the types of used compounds and operating conditions by using excitation emission matrix (EEM) fluorescence spectroscopy. The EEM measurement was performed by fluorescence spectroscopy (AQUALOG, Horiba). The excitation wavelength and the emission wavelength were fixed at 240-800 nm and 246.8-828.25 nm, respectively. The organic substance monitoring technology based on fluorescence spectroscopy may be used as an effective tool for characterizing structural changes of organic substances and evaluating the removal efficiency of AOP.

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