



## Degradation of tetracycline by advanced oxidation processes: sono-Fenton and ozonation processes

Chikang Wang\*, Bo-Ming Huang

*Department of Environmental Engineering and Health, Yuanpei University of Medical Technology, 306 Yuanpei Street, Hsinchu, Taiwan, emails: ckwang@mail.ypu.edu.tw (C. Wang), andy556681@yahoo.com.tw (B.-M. Huang)*

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### ABSTRACT

In this study, ultrasound, Fenton, ozonation and their combinations were conducted to degrade tetracycline, which is extensively used in humans and animals to treat and prevent bacterial infections and has been proven to be harmful to the environment. Experimental results indicated that the effects of ultrasonic watt and reaction temperatures in sono-Fenton systems were insignificant. However, both the addition of anions and increasing the pH to a basic condition remarkably inhibited the contribution of tetracycline degradation and mineralization. The effects of ozone gas flows and pH levels on the degradation and mineralization of tetracycline were not obvious in ozonation, due to the saturated ozone concentration in solution were close with different ozone gas flows, but they were significantly affected by the change of solution toxicity, as defined by the profiles of cell viability. As the ozonation was combined with ultrasound or/and Fenton, the required treatment durations were shortened, and the mineralization efficiencies were enhanced. Hence, operation costs were also reduced by the combination of ultrasound, Fenton and ozone. The maximum tetracycline degradation efficiency in the ultrasound/Fenton/O<sub>3</sub> process was as high as 99.8%, followed by 65% mineralization, which revealed that the ultrasound/Fenton/O<sub>3</sub> method synergistically increased the mineralization of refractory compounds; additionally, the toxicity of the treated tetracycline solution significantly decreased, whereas the cell viability increased from <50% to 94%.

*Keywords:* Cell viability; Degradation; Mineralization; Ozonation; Ultrasound/Fenton/O<sub>3</sub> process; Tetracycline

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\* Corresponding author.

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