

C. Mejia-Morales¹, D.M. Cortés-Hernández²,
F. Hernández-Aldana^{1*}, R.D. Peña-Moreno¹, N. Bonilla y Fernández¹

¹Environmental Chemistry Labs, Chemical Centre,
Sciences Institute Benémerita Universidad Autónoma de Puebla, Mexico;

²INTEL Technology of México

BROADBAND CHARACTERIZATION METHOD FOR PHOTOCHEMICAL SYSTEMS USED IN HOSPITAL WASTEWATER TREATMENT

Photochemical systems are an alternative to reduce the biological and chemical contaminants persistent in hospital wastewater treatment. Although the photochemical systems are currently used in wastewater treatments, the efficiency of these systems still needs to be studied. In this work, a broadband method to evaluate the efficiency of photochemical systems: UV/H₂O₂, UV/O₃, and UV/H₂O₂/O₃, for hospital wastewater treatments is presented. The method is based on the analysis of the broadband changes in the UV-Vis absorption spectra with the real-time radiation exposure. The results presented indicate that the UV/H₂O₂/O₃ system has a higher percentage of decontaminated water and decontamination speed than the UV/H₂O₂ and UV/O₃ systems. In this regard, the proposed method provides a good alternative to evaluate the efficiency of photochemical systems used in hospital wastewater treatments.

Keywords: wastewater, photochemical systems, broadband characterization, UV-Vis spectrum.

INTRODUCTION

Photochemical systems or advanced oxidation processes of homogeneous photolysis (POAF) have proven to be efficient in removing phenols (Kusic et al., 2006); drugs (Lester et al., 2011; Ozak et al., 2010; Hernandez et al., 2012), industrial dyes (Mitrovic et al., 2012); wine wastewaters (Lucas et al., 2010), estrogens (Irmak et al., 2005), organic matter (Lamsal et al., 2011), and for the degradation of emerging pollutants in hospital wastewater.

Currently, different strategies have been proposed to assess the efficiency of pollutants degradation (Giannakis, 2017), among them the reaction kinetics of pseudo-second order and the evaluation of the molecular weight of substances to degrade; additionally optical absorption methods have also been used for determining the pollutant concentration (Carré, 2017). Usually, the concentration changes take place in a small absorption band engaging analytical equations for its analysis (Tuhkanen, 2016), one of which is the logistic model used in hunter-prey situations (Verhulst, 1838). Nevertheless, broadband characterization methodologies have not been proposed yet

* Для листування: dmchernandez@hotmail.com

С. Мехия-Моралес¹, Д.М. Кортес-Эрнандес², Ф. Эрнандес-Алдана^{1},
Р.Д. Пенья-Морено¹, Н. Бонилья Фернандес¹*

¹Лаборатория химии окружающей среды, Химический центр,
Научный институт Benémerita Universidad Autónoma de Puebla, Мексика;

²INTEL Технологии, Мексика

*fernando.hernandez@correo.buap.mx; dmchernandez@hotmail.com

**МЕТОД ОПРЕДЕЛЕНИЯ ХАРАКТЕРИСТИК ШИРОКОПОЛОСНЫХ СПЕКТРОВ
ДЛЯ ФОТОХИМИЧЕСКИХ СИСТЕМ, ИСПОЛЬЗУЕМЫХ
ПРИ ОЧИСТКЕ СТОЧНЫХ ВОД БОЛЬНИЦ**

Представлен метод оценки эффективности фотохимических систем УФ/Н₂О₂, УФ/О₃ и УФ/Н₂О₂/О₃ для очистки сточных вод больниц. Метод основан на анализе широкополосных изменений в спектрах поглощения UV-Vis при воздействии излучения в режиме реального времени. Полученные данные показывают, что система УФ/Н₂О₂/О₃ обладает наиболее высокой степенью обеззараживания воды, чем системы УФ/Н₂О₂ и УФ/О₃. В связи с этим предлагаемый способ обеспечивает хорошую альтернативу для оценки эффективности фотохимических систем, используемых при очистке сточных вод больниц.

Ключевые слова: сточная вода, фотохимические системы, широкополосная характеристика, UV-Vis спектр.