DYE SENSITIZED TIO2-CATALYZED PHOTODEGRADATION OF SULFAMETHOXAZOLE UNDER VISIBLE LIGHT: LIGHT TUNABLE SENSITIZER

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Abstract - Visible-light-induced photocatalysis is potentially advantageous and could be an efficient approach to degrade pollutants because it can be used to selectively target specific wavelength for the photodegradation of organic pollutants in wastewater. This study demonstrates the photodegradation of sulfamethoxazole (**SMX**) using **[**Pt**(**3,3'-dicarboxy-2,2'-bpy)(1,2-benzenedithiolate)] (**Complex 1**) and **[**Pt**(**4,4'-dicarboxy-2,2'-bpy)(1,2-benzenedithiolate)] (**Complex 2**) sensitized titanium dioxide (TiO_2) under blue or yellow light (420 nm or 580 nm, respectively) irradiation in water. The **Complex 1**-sensitized TiO_2 photocatalytic oxidation of **SMX** reached almost 100% removal under 420 nm irradiation for 3 hours in water. In addition, the formation of hydroxyl radicals can be facilitated by bubbling O_2 during the photodegradation in which an effective decomposition of **SMX** was observed. Based on HPLC and UV-Vis studies of the decomposed products, it was found that SMX underwent cleavage of aromatic rings during the photodegradation process.
In this research, we have demonstrated that **Complex 1** assisted TiO_2-catalyzed **SMX** photodegradation with O_2 bubbling under blue light (or yellow light) irradiation is an effective process in eliminating this emerging organic contaminant. The degradation rate was quantitatively monitored by both HPLC and UV-Vis methods. Effects of hydroxyl radicals on decomposition of **SMX** are significant. The mechanisms of **Complex 1** assisted TiO_2-catalyzed **SMX** photodegradations with O_2 bubbling are different between 420 nm (by π to π^* transition) and 580 nm (by MLCT) light irradiations. Additionally, one of important findings is that **SMX** and its ring-containing intermediates were found to be totally destroyed by system (**Complex 1**/TiO_2/O_2 bubbling)-catalyzed **SMX** photodegradation under blue light irradiation within 3 hours. In contrast, the degradation was slower under yellow light irradiation.

Index Terms - Emerging Contaminant, Photodegradation, Sulfamethoxazole (Smx); Visible Light Irradiation.

Figures (and Tables)

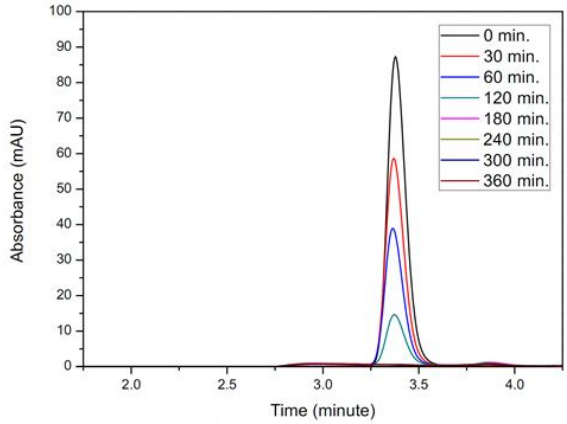


Figure 1. HPLC results of SMX photodegradation catalyzed by system (Complex 1/TiO_2/O_2 bubbling); there was almost no detectable degraded product after 6 hours of irradiation.

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