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# Microwave-assisted synthesis of selective degradation photocatalyst by surface molecular imprinting method for the degradation of tetracycline onto Cl—$TiO_2$

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## HIGHLIGHTS

- ▶ A new molecular imprinted photocatalyst was synthesized by microwave-assisted method.
- ▶ The MIP photocatalyst played the highest photocatalytic activity and selectivity.
- ▶ The effects of various factors on the degradation behavior were investigated.
- ▶ The first-kinetic and second-kinetic of photocatalytic degradation were studied.

## ARTICLE INFO

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## ABSTRACT

The Cl—$TiO_2$ imprinted photocatalyst was prepared via surface molecular imprinted technology with a facile microwave-assisted method with tetracycline (TC) as the molecular template. 4-vinyl pyridine (4-vp), trimethylolpropane acrylate (TMPTA), and 2,2-azobisisobutyronitrile (AIBN) were considered to functional monomer, cross-linking agent and initiate, respectively. The sample was characterized by X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), UV–vis diffuse reflectance spectra (UV–vis DRS), fourier transform infrared (FT-IR), transmission electron microscopy (TEM) and scanning electron microscopy (SEM). Comparing with the non-imprinted photocatalyst, the molecular imprinted photocatalyst exhibited higher photo-degradation rate for TC but also showed to enhance selective activity for target molecular. The degradation rate of TC was 72.35% within 60 min under visible irradiation.


## 1. Introduction

In the past decades, an increasing concern focuses on residues of pharmaceuticals and personal care products (PPCPs) in the environment [1]. Thereinto, antibiotics are greatly concerned due to their extensive use in human and veterinary medicine [2,3], especially for tetracycline (TC), has been widely used in human and animal treatment against infectious diseases [4]. However, these pharmaceuticals are very difficult to be metabolized completely and their residues left in the environment can induce the development of antibiotic-resistant pathogens and pose adverse health effects to humans [5,6]. Hence, various technologies are used to remove these antibiotics, such as electrochemical method [7], UV/$H_2O_2$ process [8,9], biodegradable compounds [10,11], photocatalysis [12,13]. As a promising method, photocatalysis has exhibited the high efficiency in oxidizing a great variety of organic compounds [14,16], high degradation rate, simplicity of operation and low cost. Recently, the integration of molecular imprinted technique is receiving increasing interest and attention. The growing interest in this field leads to advanced applications including sensors [17,18], selective recognition [19], solid phase extraction [20], and catalysis [21,22]. Using the molecular imprinting technique and photocatalytic technology for selective removal of the organic pollutant has confirmed those not only modify the photocatalyst, and enhance the degradation efficiency, but also improved the selectivity of photocatalyst. Molecular imprinted photocatalyst, as a material for selection, can effectively copolymerize the functional monomer and cross-linking agent in the presence of template molecular on the photocatalyst. To synthesize the molecular imprinted photocatalyst, light induced method is one of the most common methods, but it needs a long time to polymerize. Microwave-assisted method as a heating way has the advantages of warming fast and simple to operate. So in this work, microwave-assisted method is used to synthesize the molecular imprinted photocatalyst. However, the traditional molecular

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