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Article / Book Information

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Title(English)	Photocatalytic degradation of pharmaceuticals in water containing natural organic matter using magnetic carbon nanotube-TiO2 composite
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Category(English)	Doctoral Thesis
種別(和文)	要約
Type(English)	Outline

（博士課程）
Doctoral Program

THESIS OUTLINE

系・コース： Department of, Graduate major in	Civil and Environmental Engineering, Civil Engineering	系 コース	
申請学位（専攻分野）： Academic Degree Requested	博士 Doctor of	(Philosophy)	
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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

Title: Photocatalytic degradation of pharmaceuticals in water containing natural organic matter using magnetic carbon nanotube-TiO_2 composite

Background and objectives of this study

Micropollutants have become one of emerging contaminant nowadays (e.g. pesticides, pharmaceuticals, endocrine disruptors, hormones, etc.). Among various micropollutants, the presence of low concentration of pharmaceuticals in the aqueous environments have been caused significant effects to the organisms. Recently, photocatalysis using semiconductor materials have become the alternative technique to treat the pharmaceuticals in aqueous system. Generally, photocatalysis using TiO_2 is still the most promises material due to its non-toxicity, low cost, chemical and biological inert characteristics, photostable and high reactivity compared to other catalysts. Furthermore, modification of TiO_2 based material with carbonaceous material, one modified form in particular, magnetic carbon nanotube-TiO_2 (MCNT-TiO_2) has attracted a lot of attention for environmental applications due to its high conductivity, enhancing visible light absorption, and easy magnetic separation. However, the current synthetizes methods of MCNT-TiO_2 require various chemicals and are expensive, complicated, and time consuming. Moreover, the current understanding of photocatalysis degradation process of pharmaceuticals in multi component water matrices are not clear enough to explain the competition between the contaminants and inhibitor agents (i.e., natural organic matter). Therefore, the overall objective of this study was to propose a novel approach to prepare MCNT-TiO_2 and assess the performance of the developed material for the removal of pharmaceuticals in water containing natural organic matter (NOM). The experimental designs were prepared to study photocatalysis of pharmaceuticals in simple aqueous solutions using ultrapure water first, and then gradually increase the complexity by using real water matrix to mimic the full scale application of MCNT-TiO_2.

Structure of the study

The study contains seven chapter (**Figure 1**) and brief overview of each chapter is given below:

1. Chapter 1. Introduction.

   This chapter mainly discusses about the background and the objective of this research.

2. Chapter 2. Photodegradation of pharmaceuticals and personal care products in water treatment

using carbonaceous-TiO_2 composites: A review.

This chapter presents the state of scientific knowledge on photocatalysis of pharmacetucials and personal care products in water by using carbonaceous-TiO_2 (e.g., activated carbon-TiO_2, CNT-TiO_2, and graphene-TiO_2).

3. Chapter 3. Preparation of magnetic carbon nanotube-TiO_2 for pharmaceuticals removal.

   This chapter discusses the synthesis of MCNT-TiO_2 composite, MCNT-TiO_2 composite characterizations and test its photocatalytic activity on selected pharmaceuticals (e.g., carbamazepine/CBZ and sulfamethoxazole/SMX) in the absence and presence of background organic matter.

4. Chapter 4. CNT-TiO_2 photocatalytic degradation of carbamazepine: The effect of natural organic matter.

   This chapter provides comprehensive insight regarding the effect of three NOM surrogates (e.g., reverse isolate NOM, humic acid, and fulvic acid) in carbamazepine photodegradation by MCNT-TiO_2.

5. Chapter 5. CNT-TiO_2 photocatalytic degradation of carbamazepine: The effect of water matrices.

   This chapter assesses the photocatalysis performance of MCNT-TiO_2 for the removal of carbamazepine under environmentally relevant conditions (i.e., in real secondary treated wastewater and natural water).

6. Chapter 6. Conclusions and recommendations

   This chapter outlines the main findings in this study and provides recommendation for future researches.

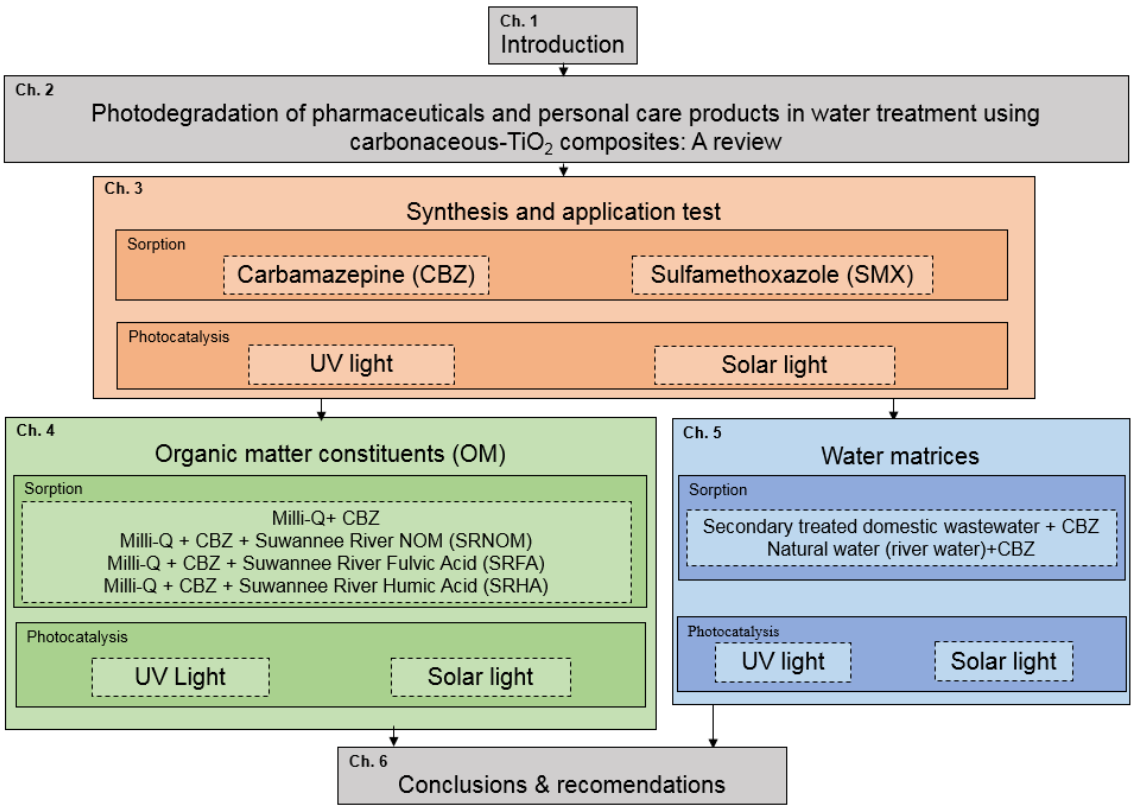

Figure 1. Overall thesis flow