摘要

本研究使用硝酸銅、硝酸鉻、硝酸鐵等金屬化合物，藉由溶膠凝膠法（sol-gel method）來製備金屬改質型奈米二氧化鈦光觸媒，使其具有吸收藍光的能力，進而藉著藍光光源激發產生電子-電洞對的分離，來催化降解亞甲基藍溶液。並以 BET 比表面積、XRD、SEM、TEM、UV-Vis 光譜、XAS 等分析儀器，鑑定光觸媒之基本特性。

實驗結果顯示，由 SEM 及 TEM 觀察到的二氧化鈦光觸媒粒徑大約為 20 nm；XRD 及 XAS 證實為均勻分散的銳鈦礦單一晶相；BET 量測比表面積約為 69.0 至 83.7 m^2/g；UV-Vis 光譜分析得知，金屬改質型二氧化鈦光觸媒在可見光區之吸收皆有增加的現象，且隨著添加之過渡金屬量越多，吸收程度越高。在經過 36 小時的藍光照光時間下，添加 0.1 % Cu/Ti 原子百分比的光觸媒具有 43 %的亞甲基藍分解效率，改質後光觸媒的光催化效率皆較未改質之光觸媒為佳。

Abstract

Metal modified titania nano-photocatalysts were prepared by sol-gel method using inorganic precursor copper(II) nitrate 2.5 hydrate, chrom(III) nitrate nonahydrate and iron(III) nitrate nonahydrate. We expect that this modification can enhance the light absorption in blue spectral region. Photo-degradation of methylene blue under irradiation of blue light (450 nm) was studied.

SEM and TEM micrographs show that the size of metal modified TiO_2 particles was approximatly 20 nm. XRD results indicate the prevailing existence of high dispersive anatase titania photocatalyst. BET surface area results show that specific surface area of the catalysts is 69.0-83.7 m^2/g. As indicated by UV-Vis spectra, an increase in metal content results in greater absorption of blue light. The greatest photocatalytic activity in this study is obtained by using 0.1 at. % Cu-TiO_2 catalyst under blue light illumination for 36 hours.

Keywords: sol-gel method, photodegradation of methylene blue, blue light absorption, metal modified TiO_2