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Journal	Advanced Materials Research (Volumes 239 - 242)
Volume	Advanced Materials
Edited by	Zhong Cao, Xueqiang Cao, Lixian Sun, Yinghe He
Pages	3090-3095
DOI	10.4028/www.scientific.net/AMR.239-242.3090
Citation	Di Fang Zhao et al., 2011, Advanced Materials Research, 239-242, 3090
Online since	May, 2011
Authors	Di Fang Zhao, Hong Dian Lu, Chan Gan Tian
Keywords	Catalyst, Palygorskite, TiO_2, Visible Light
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Advanced Materials Research Vols. 239-242 (2011) pp 3090-3095
Online available since 2011/May/12 at www.scientific.net

doi:10.4028/www.scientific.net/AMR.239-242.3090

Zn-doped Palygorskite Loaded TiO_2 For Visible-light Active Catalysts

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Keywords: palygorskite; visible-light; catalysts; TiO_2

Abstract. Zn-doped palygorskite loaded TiO_2 for visible-light active catalysts were prepared by the method of liquid ion exchange and precipitation. XRD and SEM measurments show that the titanium dioxide was loaded on the palygorskite and that composite is mainly composed of two phase,that is, the palygorskite and the nano crystalline titanium dioxide. The results show that the composite catalysts showed excellent photocatalytic ability and quantum efficient.

Introduction

Environmental pollution on a global scale have drawn much attention to the need for developing ecologically of clean chemical technology, materials, and process. Organic waste water is important group of chemicals among different pollutants of ecosystem.They are resulted of various industries such as textile, paper, rubber, plastic, and cosmetic. Nowadays, photocatalytic processes have received special attention because they can make use of abundant solar energy to transform the organic and inorganic molecules into the redox reaction in water or air[1,2]. TiO_2 is the most widely used semiconductor oxide for such applications because of its suitable flat band gap and chemical stability. However, it only absorbs the UV region of the solar spectrum which is about only 4% of the incoming solar energy. Therefore, some attempts have been directed to extend the absorption of TiO_2 the visible part of the spectrum by researchers[3,4]. They have tried to shift the Eg towards the visible light region by adding transition metal oxides such as CuO, CdO, ZnO, the Al_2O_3 and some metal cations such as Yb^{3+},Er^{3+},Ge^{3+},In^{3+}. In this way, the beneficial effects of the Zn-doping of TiO_2 catalysts has already been reported in water treatment[5-9].Compositions of the binary oxide system, such as oxide mixtures have been reported to be effective acid-base bifunctional catalysts[10-12]. It should be noted that in a previous research, Daly and coworkers[13,14], concluded that the preparation methodology for binary system not only affects its physical properties, such as surface area and porosity, but also its surface chemistry. They influences the strength of the metal-support interaction, which can affect the concentration and reactivity of coordiantively unsaturated metal sites active for hydrodesulfuration catalysis.

There is growing intersts in studying interactions between metal and support during the past few years. It is well known that the specific interaction may appreciably affect the surface properties of catalyst, and hence their reactivity[15-16].