Graphene Photocatalytic Catalyst Preparation and Properties of Composite Materials Research

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Abstract. Using a pan of the Ag/TiO\textsubscript{2}/rGO ternary composites, including ethanol as solvent, not only as a reductant in GO with the reduction of silver nitrate, the addition of ammonia water can not only catalytic hydrolysis TBOT to TiO\textsubscript{2} can also form with silver nitrate silver ammonia solution is conducive to the reduction of silver nitrate. And the GO surface exist a large amount of oxygen-containing groups can provide nucleation points for the growth of the nanoparticles. Can control the dosing ratio of TBOT and GO different morphology of TiO\textsubscript{2}/rGO composite material is prepared. Photocatalytic degradation of methylene blue test studied Ag modified enhanced the photocatalytic activity of TiO\textsubscript{2} light influence.

1. Introduction

The Ag/TiO\textsubscript{2}/rGO preparation and photocatalytic properties of ternary composites is studied. Graphene composites with silver nanoparticles can be used in surface enhanced Raman SERS, sterilization, such as catalysis, batteries play an important role in the field of (1-8). The current is one of the focus group studies both at home and abroad. Ag with rGO composite for the Ag/TiO\textsubscript{2}/rGO provides a new way of thinking, by above knowable confirmed photocatalytic activity of TiO\textsubscript{2}/rGO. If the TiO\textsubscript{2}/rGO again and Ag NPs composite is equal to the modified TiO\textsubscript{2} and rGO composite, using graphene excellent electrical conductivity can be Ag NPs with TiO\textsubscript{2} closely linked together. This study obtained the graphene synthesis silver compound nano flake structure, not only prevents the reunion of graphene, and load in graphene layer upon layer between the silver nanoparticles to improve the specific surface area of nano silver, which significantly improves the carrier catalyst on the reduction of nitro phenol reactivity. This study is put forward based on structured carrier in the controlled synthesis of nano metal surface, not only effectively improve the stability and catalytic activity of metal nanoparticles, and carrier of the large size is easy to realize the separation and recovery of the catalyst. This study for the functional nano metal catalysis has universal significance in the study of composite material.

2. Experimental

100mL GO adding tetrabutyl titanate ethanol solution, mixing 5 min. Stir in AgNO\textsubscript{3} 10mg, 15min. Add the PVP 50mg, add 0.1mL ammonia and quickly transferred to the five ptf reaction kettle in oven at 180\textdegree C 18h, the product obtained alternately with deionized water,
ethanol washing three times. Regulation of tetrabutyl titanate can be prepared for the amount of the different shape of rGO/TiO₂ composite materials.

3. Results and Discussion

![Figure 1. XRD patterns of the Ag/TiO₂/rGO.](image)

XRD characterization of Ag/TiO₂ / rGO, diffraction Angle is 38.1° and 44.2° and 64.4° and 77.4° Ag characteristic peak, diffraction Angle is 25.2° and 48.1° and 53.8° and 62.7° in TiO₂ characteristic peak. Less TiO₂ diffraction peak may be the cause of the Ag peak was too was caused by its cover. No graphene diffraction peaks might be due to strong diffraction peaks of the titanium dioxide at 25.3° obscures the graphene weaker signal. XRD characterization of Ag/TiO₂ / rGO success of ternary composites preparation.

![Figure 2. SEM and EDS spectrum of Ag/TiO₂/rGO.](image)
Duo to Ag/TiO$_2$ / rGO ternary composites of SEM (figure 2) to detect the graphene surface load has a large size between 50-100 nm silver nanoparticles. Combining and titanium dioxide and graphene, particle size of more than 10 nanometers, under the condition of 180°C formed between TiO$_2$ and rGO Ti - O - C key. Graphene nano appear typical fold, combines Ag nanoparticles and titanium dioxide and its surface. EDX spectrum diagram (D) as shown in figure 2 shows the Ag and the characteristic peaks of Ti.

![Graph](image1)

Figure 3. UV−vis absorption spectra of(A) TiO$_2$/rGO; (B) Ag/TiO$_2$/rGO.

In order to observe the fine structure of Ag/TiO$_2$ / rGO, characterization of the composite transmission electron microscopy (sem). Graphene sheets and Ag and TiO$_2$ good combination,
the particle size of the silver nanoparticles is about more than ten nanometers ornament in graphene sheet, and relatively small uniform distribution in graphene nano TiO$_2$ particle size on a chip, using graphene excellent electrical conductivity can Ag and TiO$_2$ in photocatalytic reaction process together, to reach the goal of enhancing TiO$_2$ visible light catalytic efficiency.

4. Conclusions

In this chapter, we are using solvent hot method, sol-gel on the carrier of graphene, the synthesis of Ag/TiO$_2$/rGO composite materials. Ag to join to play an important role in improving the photocatalytic activity of TiO$_2$, in the preparation of TiO$_2$/rGO composite materials, on the basis of introducing the precious metals, not only will not affect the adsorption of composites can also boost the photocatalytic activity of TiO$_2$, through visible light catalytic degradation of methylene blue solution obtained under the condition of TiO$_2$/rGO composite materials and Ag/TiO$_2$/rGO visible light catalytic properties of composite material has a certain, after 4 h of TiO$_2$ visible light/rGO composite materials and Ag/TiO$_2$/rGO composite photocatalytic efficiency were 53.3% and 78.9% respectively.

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References