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ORIGINAL RESEARCH ARTICLE

Preparation and Photocatalytic Properties of Ag_2CO_3 / Graphene Composite Photocatalyst

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ABSTRACT

Silver-based photocatalytic semiconducting materials have drawn the attention of reseachers for their high visible photocatalytic activity. However, the silver-based photocatalytic semiconducting material exhibits light corrosion during the photocatalytic reaction, and the photocatalytic stability is poor. Therefore, improvingthe photocatalytic stability and inhibition of light corrosion of silver-based photocatalytic semiconductor materials have been the focus of attention. In this paper, according to the principle of photocatalysis and the principle of photo-corrosion, it is proposed to improve the photogenerated electrons and hole separation of photocatalytic semiconductor materials, to rapidly transfer photogenerated electrons, to inhibit photogenerated electrons and Ag + to prevent light corrosion, Stability of the catalyst. Ag2CO3 / GO composite photocatalytic materials were synthesized by precipitation method using polystyrene as photocatalyst. The characterization and photocatalytic performance tests showed that the graphene has a good auxiliary effect, which can promote the separation of photogenerated electrons and holes of Ag2CO3 and transfer the photogenerated electrons into O2 in H2O in time, thus suppressing the light of Ag2CO3 / GO photocatalytic materials Corrosion phenomenon, improve the photocatalytic performance. Ag2CO3 / GO-1.0 has the best catalytic activity for the catalytic activity and stability of Ag2CO3 / GO in the photocatalytic decomposition of methyl orange. Therefore, graphene as a photocatalytic auxiliaries can effectively improve the photocatalytic stability of silver-based photocatalytic materials and have some reference significance for improving the stability of other photocatalytic materials which are prone to light corrosion.

KEYWORDS: photocatalysis; graphene; silver carbonate

1. Chapter One Introduction

1.1. Research background of photocatalysis

What is photocatalysis? Under normal circumstances, it refers to the catalytic reaction of photocatalyst in the presence of external light [1].

With the development of the global economy and technology, environmental pollution and energy has become an obstacle to the economic advancement. Especially in developing countries,economic development leaves a detrimental impact on ecological environment. An official of from the Environmental Protection Bureau of pointed out that some of the enterprises that cause environmental pollutionare not suspended from operation nor shut down, because of their economic impact and job opportunities, and the fact that they have become inelastic demands.. The natural environment is the foundation of our human beings, including the survival of other animals and plants, and now more and more serious environmental pollution, that is, off the way of our future generations, cleaner production and pollutant management has become an urgent task of the contemporary. Of all the pollutions, chemical pollution causes the greatest harm due to its long degradation cycle and therefore the most urgent need to be dealt with. And the existing use of a wider range of pollution control processes, such as physical material adsorption, microbial degradation, incineration, landfill, etc., although to a certain extent, the governance of pollution, but those processes are some palliative, Can not be a wide range, large-scale use, can not completely clean up and eliminate pollutants, more terrible is that most have a secondary pollution; and those who deal with better results, because of its huge cost, energy consumption, Complex and other factors, the probability of adoption and use of enterprises is very small. Therefore, the urgent need for a new type of technology to change the situation, photocatalytic technology is born in this environment and become a popular study.

In the 1970s, photocatalyst was discovered by a Japanese postgraduate student while conducting an experiment. He found that in the presence of a substance, the sun light decomposed H2O into H2 and O2. This phenomenon was later known as the 'Honda-Fujishima Effect'. Since then, photocatalysis has been recognized and studied by a scholar as a new field.

Photocatalytic technology has the following advantages: Firstly, photocatalytic reaction does not require energy consumption, it uses solar energy which is sustainable and ubiquitous. . Secondly,photocatalytic reaction is mild, easy to control, high operating environment safety Thirdly, the production of photocatalyst is simple, stable, energy-saving and environmental friendly, and some can be recyclable; Fourthly, the ; Fourthly, photocatalysis technology can effectively degrade organic pollutant into carbon dioxide and water, without causing secondary pollution, it can as well oxidize some harmful inorganic substances into harmless inorganic substances. Therefore, the advantages of photocatalytic technology as an increasingly arid environment in the era of emerging technologies, its advantage is obvious, its huge application prospects, won the favor of many scholars.

1.2. Principles c

Typically, the phc ... m is usually a gas or liquid phase, so that i ... sis.

In general, the va ... gy band structures of the semiconductor pa ... and conduction band (conduction band, CE ... for high energy state, the price is all electro

As shown in Figu ... e band electrons will charge and skip the f ... electrons are excited in the conduction bai ... :ching, to the particle surface [3].

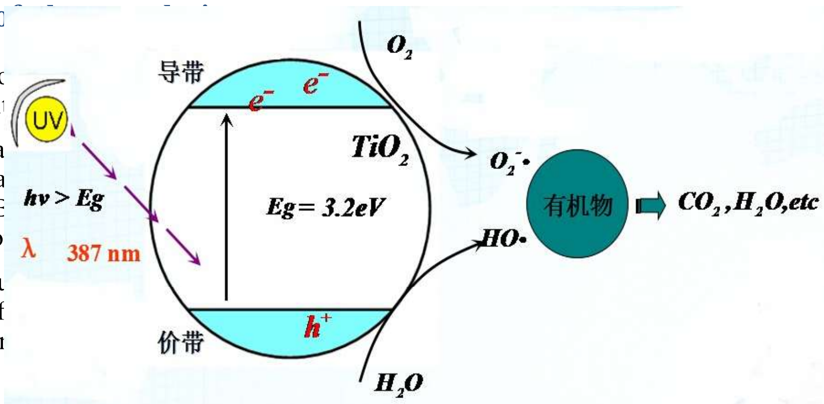

Figure 1. Schematic diagram of the reaction

In the TiO2-H2O system, the photocatalysts converge with the semiconductor oxygen molecules to produce superoxide ions O2-, and then undergo some processes to produce OH. At the same time, the hole with the attached water in the outer layer, covering the outside of some particles will produce. · OH and O2- contain strong oxidizing properties so that organic compounds with outer layers are completely decomposed into CO2 and H2O.

When the semiconductor is less than 387nm wavelength by the external light, the valence band electrons in the catalyst surface excited to evolve into photoelectrons and holes, but also the reaction, the semiconductor valence band hole and the conduction electrons can be re-merged excited state , So that the energy of light to heat or other forms of escape, as shown below:

$$TiO_2 + hv \longrightarrow TiO_2 + h^+ + e^-$$

$$h^+ + e^- \longrightarrow \text{复合} + \text{能量}$$

When a suitable capture agent (such as H2O or O2) is present around the catalyst, the following reaction occurs:

The electrons generated in the photocatalytic reaction react with the surface-adsorbed O2, and O2 not only participates in the reduction reaction but also provides another way for the production of the surface OH. [4] The specific reaction formula is as follows:

$$O_2 + e^- \longrightarrow \bullet O_2^-$$

$$H_2O + \bullet O_2^- \longrightarrow \bullet OOH + OH^-$$

$$2\bullet OOH \longrightarrow O_2 + H_2O_2$$

$$\bullet OOH + H_2O + e^- \longrightarrow H_2O_2 + OH^-$$

$$H_2O_2 + e^- \longrightarrow \bullet OH + OH^-$$

In addition, the presence of O2- was detected in this reaction. It was presumed that there might be a reaction as follows:

$$H_2O_2 + \bullet O_2^- \longrightarrow \bullet OH + OH^-$$

In this series of reactions, there are very active and strong oxidizing · OH, · O2- and · HO2 occurs, these free radicals can be organic matter into CO_2 and H_2O and other inorganic small molecules.

1.3. Preparation of photocatalyst

1.3.1 Preparation of Nano - TiO2 Photocatalyst

The nanometer titanium dioxide is usually prepared by gas phase or liquid phase.

Hydrogen oxide flame hydrolysis, oxidation, decomposition method is the use of more gas phase method. The preparation of nanometer TiO_2 particles by vapor phase method is to heat the titanium salt into steam or to heat the body into titanium salt, so that the titanium salt undergoes chemical or physical changes, and then let the gasification of titanium salt cooling, condensation, and finally into nano Titanium dioxide crystals. The use of this process to produce rice particles not only have good chemical activity, and small size, uniform size, high purity, suitable for products with high production lines. The shortcomings of the gas phase method are: high investment costs, complex processes, and the yield is still relatively low.

The current theoretical study and the actual production of hybrid nanosized TiO_2 films and ultrafine powder using the more common route is the liquid phase method. There are sol-gel method, hydrothermal method, deposition method, hydrolysis method, microemulsion method [5] universal preparation method. Its basic principle is: the use of soluble metal titanium salt as raw material, according to the desired effect of the product composition of the original solution prepared, and then use the impurity-free precipitant to metal ions evenly precipitated out, the final filter, washing and drying made Finished product. Compared with the gas phase method, the preparation of semiconductor materials by liquid phase method has the advantages of low investment cost, low experimental temperature, simple process and low energy consumption. It is an ideal process for preparing nanometer TiO_2 photocatalyst crystal and thin film.

1.3.2 Preparation of silver-based photocatalytic materials

A large number of studies have shown that most of the semiconducting photocatalytic materials can be modified by metal silver to greatly improve the photocatalytic performance on the fundamental basis, resulting in raw materials can not achieve the effect. According to finishing, the main modification methods are:

First, the orientation changes the original band structure of the semiconductor, can improve its absorption efficiency of light. Experiments show that the Ag-ion doped with semiconducting materials, the band structure has changed, Li Xinyong [6] experiments found that nano-Ti02 added Ag ion dopant phase to improve its photocatalytic performance by 63%.

Second, Ag is supported on the surface of the catalyst to reduce the absorption of photogenerated electrons by reducing the recombination rate of free photogenerated electrons and residual holes during the reaction, thereby increasing the absorption efficiency of photocatalysis.

Thirdly, the effect of nano-Ti02 on sunlight can be enhanced by the plasma resonance effect. Yu Jianguo et al. [7] reported that the activity of Ag-Ti02 composite hollow spherical photocatalyst degraded Rhodamine B under visible light was 2.5 times that of Ti02 hollow sphere.

The existing semiconductor photocatalyst is mainly composed of metal oxides, salts and other composites and other compounds. Silver modified nanocomposites are composed of silver-based materials and semiconductors.

Although the silver modified nano-composite photocatalyst preparation process is still a lot, but the most mature is the metal surface load metal Ag, which is currently the most important and most direct modification process [8]. In addition, the chemical reduction method, the photoreduction method, the thermal reduction method is now in the laboratory and the real industry some use more load method.

1.4. Influencing factors and improvement of photocatalysis

(1) influencing factors

In general, the reaction conditions and the performance of the agent itself will affect the performance of the reaction. The environmental conditions of the photocatalytic reaction include light intensity, type of contaminant, oxygen content, temperature and humidity of the reaction, and the manner of loading the catalyst. The original performance of the catalyst mainly refers to the crystal, particle size, specific surface area, width of the forbidden band, the absorption capacity of the external light, the recombination rate of the photoi electrons and the hole. After a period of use, the photocatalyst may also be inactivated, so the regeneration process also affects the subsequent catalytic effect.

(2) improved method

Not the best, only better. And all the things in reality, when it becomes the focus of all, its performance will be concerned about. With the deepening of the research and application of photocatalytic technology, the defects of the existing nano photocatalyst material itself have seriously hindered the development and application of its industrialization, so that the improvement process is constantly updated. There are two main problems with the existing photocatalyst materials: First, because most of the semiconductor bandgap is wide (3.2eV), only the ultraviolet light in the sun response, the vast majority of sunlight can be visible, Make full use of sunlight. Second, in the process of photocatalysis, photogenerated electrons and holes are prone to recombination, resulting in the semiconductor material quantum yield and photocatalytic activity factor is relatively low [9]. Therefore, the most important research direction of current photocatalytic materials is to modify the semiconductor so that it can respond to the majority of the visible light in the sun, while at the same time trying to increase the photogenerated quantum yield of the semiconductor material. Surface precious metal deposition, narrow bandgap semiconductors, transition metal ion doping, dye sensitization, nonmetallic doping, etc. are some of the more common methods to improve the catalytic performance of semiconductors [10].

1.5. Application of photocatalytic technology

1.5.1 Environmental Governance

Photocatalytic in the environmental management of the main degradation of sewage in the organic matter and purification of two aspects of waste gas. Industrial development has improved the quality of life of people, industrial waste water is also a serious break in the ecological, especially in small factories in the industrial wastewater of alkanes, aliphatic hydrocarbons, aromatic hydrocarbons, aliphatic carboxylic acid, phenolic, halogenated hydrocarbons, These contaminants are difficult to remove in the usual conventional way, or the removal is costly. And a large number of studies have shown that most of the organic matter can be carried out in the semiconductor surface of the photocatalytic reaction, through physical and chemical reactions decolorization, detoxification, decomposition into non-toxic inorganic small molecules (carbon dioxide and water), which can completely eliminate the Environmental hazards. This process is also effective for the degradation of the residents' kitchen oil and flue gas and industrial exhaust gas. In addition, most of the sulfur oxides and nitrogen oxides contained in the automobile exhaust gas can be decomposed by photocatalytic technology.In addition, the photocatalysis is also used for indoor deodorant, purifying the smell of cigarettes, handling the smell of the refrigerator.

1.5.2 Catalytic hydrolysis of water to produce hydrogen

The energy problem has become one of the most urgent problems in today's countries, and a large part of the conflict in the Middle East is caused by a fight for oil. Fossil energy is the legacy of the wealth of ancestors, with a gram less than one gram, there is always exhausted day. Hydrogen can be clean, efficient, renewable and easy to transport and other carriers do not have the characteristics, is recognized as the most likely carrier of energy. In many hydrogen energy development technologies, photocatalytic decomposition of hydrogen is considered to be the most ideal and promising hydrogen energy because of its low cost of raw materials, low process energy consumption, no secondary pollution and other reasons, in many processes stand out One of the means of development. At present, the photocatalytic decomposition of water hydrogen, how to improve the visible region of quantum efficiency, is the most important research objectives, but also one of the most challenging direction. In recent years, China's Dalian Chemical Physics in the new response to visible light photocatalyst material has made some breakthroughs, have developed $ZnIn_2S_4$, $Y_2Ta_2O_5N_5$ and other high-performance visible light and light materials, expanding the use of new semiconductor water production of hydrogen material system.

1.5.3 Antibacterial activity of Photocatalysis

Photocatalytic materials have a very good inhibition effect on bacteria, fungi, algae, etc., and even inhibit the growth of virus and cancer cells and reproduction. In the sterilization process, the photocatalyst produced by the active group not only can kill bacteria, but also degradation of endotoxins and other cell lysates and other organic pollutants, so that completely harmless decomposition, which is other antibacterial agents can not be achieved effect. And studies have shown that the experimental conditions after a short period of time, the antibacterial effect is still valid. With the continuous development of the world economy and technology, the research on the antimicrobial performance of TiO_2 photocatalysis has been deepening. Some research results have been put into industrial production and applied to our popular life, such as antibacterial glass, antibacterial plastic The

1.5.4 Photocatalytic extraction of precious metals

Many of the production plants in the industry need to use precious metals because of the process, so in industrial waste water, often contain some precious metals, if you can recover those precious metals, this is definitely a good thing for two purposes. However, the conventional metal ion extraction technology pure extraction, for those very thin solution is simply can not be extracted. The use of photocatalytic extraction technology can solve this limitation. Photocatalytic extraction technology is the use of semiconductors in the light conditions generated by the active group of precious metals enrichment in the material surface, and then again conventional extraction. In the study, the use of TiO2 as a photocatalyst from the silver ions in the solution of metal silver is found in the study found that the direct use of sunlight can precipitate silver, the greater the intensity of light, the higher the efficiency of extraction and enrichment, and silver precipitation rate and The temperature is not directly linked.

1.6. silver carbonate

1.6.1 Introduction to Silver Carbonate

Silver carbonate, chemical formula: Ag2CO3. It appears as white powder when being precipitated, in pale yellow when it is freshly produced and turns darker after some times. It is light-sensitive, fully dissolved in ammonia, HNO3, KF, Na2S2O3, water and partially dissolved in alcohol. It must be be protected from light.

Ag2CO3 as a visible light photocatalytic material in recent years was found, its photocatalytic relative to the other particularly good, so that we all agree that Ag2CO3 in the catalytic industry has played a very promising material, so that Ag2CO3 and its synthetic material It is valuable to take a deeper, higher-level Quest. Now the nature of Ag2CO3 and the role of light to explore is still at the preliminary stage, there are treatment we later continue to work hard.

1.6.2 Properties of silver carbonate

Table 1. Physical parameters of silver carbonate

index	parameter
molar mass	275.75 g/mol
density	6.08 g/mL
temperature	210°C
boiling point	333.6°C
solubility (water)	0.0032 g/100 mL(20°C)
appearance	yellowish green powder

1.6.3 Preparation of silver carbonate

In the absence of light, the use of Na2CO3 or NaHCO3 and AgNO3 for metathesis reaction, or the use of purified Ling silver mine.

1.7. graphene

1.7.1 Introduction to graphene

In the fifties of the twentieth century, Philip Wallace has been on the internal level of graphen has a certain inquiry. Then, J. W. McClure introduced the wave function equation of graphene. British physicists Andre Geim and Konstantin Novoselov successfully extracted graphene from graphite in 2004. Graphene is no longer the legendary material.

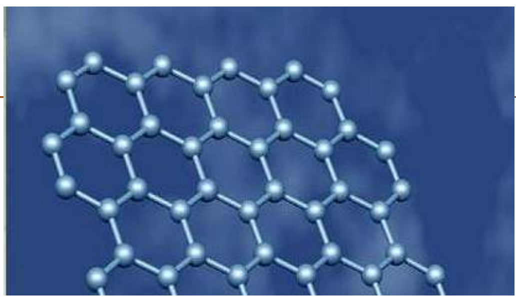

Figure 2. Graphite structure of graphene

1.7.2 Properties of graphene

Graphene is the world's thinnest and hardest nanomaterials, and the monolithic graphene thickness is only a single carbon atom, which leads to the fact that graphene has many properties that graphite does not have.

High stability: The carbon atoms of graphene molecules are covalent-bonded, not easily broken, and therefore has good stability. The structure of graphene is a large delimited π bond, the C-C bond is stronger than a single diamond, from the thermodynamic point of view, the melting point of graphite is higher than that of diamond, so graphite is more stable than diamond.

Strong Conductivity: All atoms of graphene are delocalized, and the upper and lower sides of the board electrons are free to move. Due to the stability of the covalent bond, the crystal defective cavity of the graphene does not occur or the heteroatom, and the large π bond electrons are moved without interference, the integrity of the crystal defects, high-speed conduction makes the graphene have excellent conductivity.

High transmittance: light can not penetrate the nucleus, but can penetrate the vast space between the nucleus. Graphene is a thin state, when a number of graphene molecules stacked together, because the carbon ordered nuclei, light can easily penetrate the gap side team showed a transparent state, graphene is a high light-transmitting material.

The content of this topic and the research content

Photocatalytic degradation of organic matter is a new type of environmental protection means, the advantages are obvious. Methyl orange is a an organic chemicals which is commonly used in laboratory and industry . Methyl orange is disposed directly into the sewer, over the time, this will have a great impact on the environment.

The subject is to study the catalytic effect of methyl orange solution induced by the composite material of silver-based materials and carbon nanomaterials , in the presence of visible light . In this paper, the use of silver carbonate and graphene composite, tested the different proportions of composite materials in the same light degradation.

2. Experimental

2.1. Main reagents and instruments

The reagents are shown in Table 2:

Table 2. Major reagents for the experiment

No.	Raw material and reagent	specification	Molecular formula
1	silver nitrate	pure	AgNO3
2	sodium bicarbonate	pure	NaHCO3
3	graphene	pure	GO
4	methyl orange	20mg / L	-

The experimental instruments are shown in Table 3:

Table 3. Major reagents for the experiment

No.	Equipment name	Specification	Origin
1	magnetic stirrer	85-2 constant temperature magnetic stirrer	Jiangsu Zhongda Instrument Factory
2	Analysis of balance	PTX - FA110	Fuzhou Huazhi Scientific Instrument Co., Ltd
3	Spectrophotometer	UV-1240, SHIMADZU	Shenzhen Ruisheng Technology Co., Ltd.
4	ultrasonic cleaner	KQ218	Kunshan City ultrasound Instrument Co., Ltd.
5	Photochemical Reaction Instrument	BL-GHX-IV	Shanghai Bilan Instrument Co., Ltd.
7	X-ray diffractometer Rigaku	RINT-2000	Guangzhou Jia Rui Scientific Instrument Co., Ltd.
8	Scanning Electrode Microscope	Hitachi	Japan HIROX (ho as) company
9	electric drying oven	DUG-9036A	Shanghai Jinghong Experimental Equipment Co., Ltd.

2.2. Preparation of photocatalytic materials

A certain amount of graphene was added to a beaker containing 50 mL of 0.058 M AgNO3 solution, and the beaker was placed in an ultrasonic wave for 25 min to promote the dispersion of the graphene particles in the AgNO3 solution. 50 mL of 0.029 M NaHCO3 was added dropwise to the mixed solution of graphene and AgNO3, stirred for 1 h under a shaking condition with a magnetic stirrer, filtered and washed several times with deionized water to give a solid precipitate, precipitate Ag2CO3 / GO composite photocatalytic material is formed in the reactor. Ag2CO3 / GO-0.5, Ag2CO3 / GO-0.5, Ag2CO3 / GO-1.0, corresponding to 0.25% of Ag2CO3 / GO-0.25, Ag2CO3 / GO-0.5, Ag2CO3 / GO-1.0, respectively, in accordance with the mass percentage of Ag2CO3 %, 0.5%, 1.0% by weight of graphene.

2.3. characterization

(1) X-ray diffraction analysis (XRD)

The composition of the catalytic material was determined by the Rigaku RINT-2000 type X-ray diffractometer of Guangzhou Jia Rui Scientific Instrument Co., Ltd. for the determination of Ag2CO3 / GO semiconductor composite semiconductor material. Using Cu Kα, the excitation voltage was 40 kv, the scanning analysis speed was 0.067 o / s, and the diffraction angle was 10 to 90 o.

(2) Morphological analysis

The morphology of Ag2CO3 / GO photocatalyst was characterized by field emission scanning electron microscopy (SEM). The field emission model was Hitachi.

2.4. Photocatalytic performance test

The optimum conditions for the photocatalytic degradation of methyl orange were determined by Ag2CO3 / GO photocatalyst and the properties of the catalytic materials were evaluated.

The specific process was as follows: 0.05 g of photocatalytic material was dispersed in 25 mL methyl orange solution at a concentration of 10 mg / L at room temperature, and the mixture was stirred for 30 min in the dark so that the methyl orange was adsorbed on the surface of the photocatalytic material. Attached to balance. After equilibration, the 350 M xenon lamp was used to achieve the equilibrium methyl orange solution. Under the aid of the filter (≥400 nm), the methyl orange was decomposed by visible light photocatalysis. The average intensity of light is 40 mW / cm2, and the concentration of UV-visible spectrophotometer is UV-1240 and SHIMADZU. The UV-visible spectrophotometer is UV-1240 and SHIMADZU.

When the concentration of the solution is lower, the absorbance and the concentration are proportional to each other, and can be explained by Bill-Lambert's law:

A = alc

L is the distance through which the light passes through the sample.

C is the concentration

A is the absorption coefficient, is the nature of the material.

Therefore, during the photocatalytic reaction, the change of methyl orange concentration is: C / C0 = A / A0

3. Results and Analysis

3.1. XRD analysis of Ag2CO3 / GO photocatalyst

The crystal structure of Ag2CO3 / GO photocatalyst under different compositions of graphene was tested by XRD analysis of the prepared Ag2CO3 / GO photocatalyst. The results are shown in Fig.

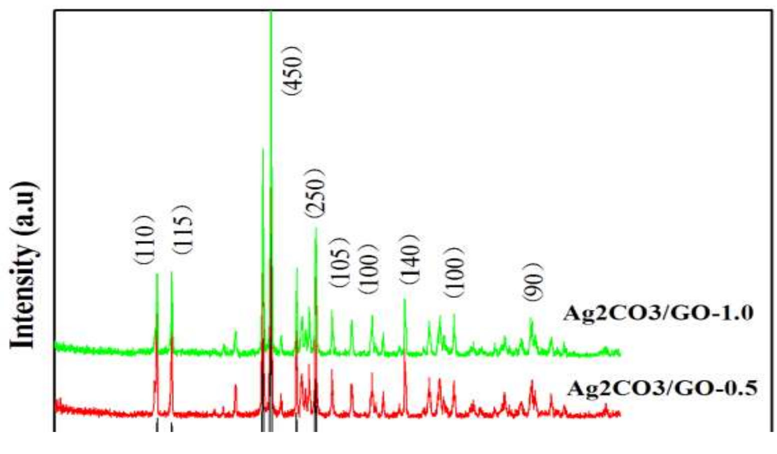

Figure 3. X-ray of composite materials

Figure 3-1 showed that the Ag_2CO_3 / GO photocatalyst exhibits diffraction at 2θ of 18.8 ° C, 22.5 ° C, 33.1 ° C, 37.5 ° C, 41.9 ° C, 44.5 °, 46.8 °, 57.7 ° and 66.6 ° (02-0505), the samples prepared were Ag_2CO_3, and the samples were prepared from Ag_2CO_3 according to Ag_2CO_3 standard data. The samples were Ag_2CO_3, and the samples were prepared from Ag_2CO_3, The spectrum can be seen, Ag_2CO_3 / GO peak type sharp, peak intensity is relatively strong, there is no impurity peak, so it has a good degree of crystallinity.

From the XRD pattern of Ag_2CO_3 / GO, the doping of GO did not change the characteristic peak of Ag_2CO_3, and the characteristic peak of GO did not appear in the graph, which may be that the amount of GO doped was relatively small Far less than Ag_2CO_3 crystallinity, and its characteristic peaks are covered by Ag_2CO_3.

3.2. Morphology Analysis of Ag_2CO_3 / GO Photocatalyst

In this experiment, the appearance of Ag_2CO_3 / GO photocatalyst was observed by scanning electrode microscope. The electrode scanning chart .

From the SME diagram of Ag_2CO_3 / GO photocatalysis, the particle size of the prepared Ag_2CO_3 / GO photocatalyst is about 3μm, and the dispersion is uniform and mostly irregular. Where GO is around the Ag_2CO_3, but not around all Ag_2CO_3.

3.3. Synthesis of Ag_2CO_3 / GO photocatalyst

In this experiment, the photocatalytic activity of Ag_2CO_3 / GO photocatalyst was studies by using GO with different contents. The optimum degradation of Ag_2CO_3 / GO photocatalyst was determined.

The photocatalytic activity of Ag_2CO_3 / GO photocatalyst and the reaction rate are related to the content of GO. In the initial content of GO, that is, the composite of 0.25% of the GO, the weakest photocatalytic activity, the reaction rate is the most slow, methyl orange degradation takes 30min, the reaction to reach equilibrium, and methyl orange decolorization rate of 90 %about. The photocatalytic activity of Ag_2CO_3 / GO photocatalyst with 1% GO was the strongest and the reaction rate was the higheest. The degradation of methyl orange was only 15min, the reaction was balanced and the decolorization rate of methyl orange was 90% the above. It is shown that Ag_2CO_3 doped GO can improve the photocatalytic activity of Ag_2CO_3 / GO photocatalyst. And the addition of 0.5% GO, the degradation time of methyl orange is 25min, and the decolorization rate of methyl orange is about 90%, and its catalytic activity is moderate. This shows that in a certain range , The greater the amount of GO, the higher the activity of Ag_2CO_3 / GO photocatalyst, which has a certain limit.

Therefore, it was concluded that the content of GO has an important effect on the photocatalytic activity and reaction rate of Ag_2CO_3 / GO photocatalyst. Among them, in this experiment, the best doping content of GO is 1% of Ag_2CO_3 mass.

3.4. Photocatalytic Stability of Ag_2CO_3 / GO Photocatalyst

To determinedthe stability of Ag_2CO_3 composite GO photocatalyst, the photocatalytic activity of Ag_2CO_3 / GO photocatalyst on methyl orange solution.

Ag_2CO_3 / GO photocatalyst is still highly efficient and the degradation rate of the Ag_2CO_3 / GO photocatalyst is more than 95%, and the degradation rate of Ag_2CO_3 / GO The catalyst has good stability.

4. conclusion

Ag_2CO_3 / GO composites were prepared by homogeneous precipitation method and supported on graphene oxide GO. The properties of Ag_2CO_3 / GO composites were investigated by UV-Vis spectrophotometer. The properties and morphology of Ag_2CO_3 / GO composites were analyzed by X - ray and scanning electron microscopy. This study showed that the Ag_2CO_3 composite supported on the catalyst (graphene) can reduce the recombination rate of photo-inducedelectrons and holes in a certain range and improve the catalytic performance of silver-based materials. In this experiment, the composite material doped with 1.0% graphene demonstrated the best catalytic effect.

References

1. Alexander A. Balandin, Suchismita Ghosh, Wenzhong Bao, et al. Superior Thermal Conductivity of Single-Layer Graphene. Nano Letters, 2008, 8 (3): 902,906

2. R. R. Nair, P. Blake, A. N. Grigorenko, et al. Fine Structure Constant Defines Visual Transparency of Graphene. Science, 2008, 320 (5881): 1308
3. Carey J H, Lawrence J, Tosine H M. Photodegradation of PCBs in the presence of titanium dioxide in aqueous suspension [J]. Bulletin of Environmental Contamination and Toxicology, 1976, 16 (6): 697-701.
4. Ryu J., Lee S. H., Nam D. H., et al. Rational design and engineering of quantum-dot-sensitized TiO2 nanotube arrays for artificial photosynthesis [J]. Advanced Materials, 2011,23 (16): 1883-1888
5. Choi Y. J., Seeley Z., Bandyopadhyay A 'et al. Aluminum-doped TiO2 nano-oxide for gas sensors [J]. Sensors and Actuators B: Chemical, 2007,124 (1): 111-117
6. Li X, Zou X, Qu Z, et al. Photocatalytic degradation of gaseous toluene over Ag-doping TiO2 nanotube powder prepared by anodization coupled with impregnation method [J], Chemosphere, 2011, 83 (5): 674-679 The
7. Xiang Q J5 Yu JG, Cheng B, et al. Microwave-Hydrothermal Preparation and Visible-Light Photoactivity of Plasmonic Photocatalyst Ag-TiO2 Nanocomposite Hollow Spheres [J], Chemistry-an Asian Journal, 2010,5 (6) 1466-1474.
8. A. K. Geim, K. S. Novoselov. The rise of graphene. Nature Materials, 2007, 6: 183-191
9. Liu Shouxin, Liu Hong. Photocatalytic and photoelectric catalytic base and application [M]. Beijing: Chemical Industry Press, 2005.
10. Liu Longxue Min, Chu Sheng et al. Modification and modification of new nano-TiO2 photocatalyst [J]. Materials Review, 2009, 17: 103-106