Research Article

Photocatalyst and Decoration Design in Indoor Public Spaces Based on the Photocatalytic Function of Nanometer Titanium Dioxide

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Received 18 May 2022; Revised 24 June 2022; Accepted 1 July 2022; Published 10 August 2022

Academic Editor: Haichang Zhang

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The process of decorating interior spaces often produces substances that are harmful to the human body, which seriously spoils the decorating experience. Photocatalyst is the oxidant of nanometer titanium dioxide. It cannot be oxidized by itself. This article aims to discuss photocatalysts and interior and exterior design. When there is light in the room, the photocatalyst will fully integrate with the light, which has a strong catalytic and degrading effect. This can degrade indoor formaldehyde and other pollutants while also having a sterilization effect. The principle of the photocatalyst is to absorb ultraviolet rays in light. When impurities appear in the air, they are destroyed by the photocatalyst, and the impurities are converted into substances that are harmless to the human body. We tested the formaldehyde and SO2 content in the room after the photocatalysis of titanium dioxide, and analyzed the photocatalyst and decoration design in indoor public spaces. The research results showed that the effect of the photocatalyst is about 20% better than the traditional explanation. Functionally, it can deodorize toilets, garbage, etc., and the effect is very obvious.

1. Introduction

A comfortable, lively, and beautiful home environment has become the direction of more people’s efforts. Interior decoration design directly affects the quality and impact of interior decoration, and the effect of interior decoration depends on the choice and application of interior decoration materials. On the one hand, the choice and use of decorative materials determine the visual and aesthetic effects of interior decoration. On the other hand, to strengthen the control and quality of indoor decoration on space pollution, it is necessary to carefully select indoor decoration materials. However, current interior decoration and decorative materials are not guaranteed to be natural and nonpolluting, which poses a serious challenge to interior decoration.

As people’s understanding of interior decoration is changing, people’s needs for the indoor environment are constantly improving. The indoor environment is not only a demand for beauty and practicality, but also a combination of art and science. After the investigation of the traditional decoration environment and the investigation of the interior decoration of green buildings, as well as the investigation and analysis of the interior decoration environment after the use of photocatalyst materials, in addition to the countermeasures for the application of relevant new purification materials to the interior, and the solution of photocatalyst, there will be problems and defects in the design of material combinations. The indoor environment after the application of photocatalyst materials and environmentally friendly materials is not only purified but is also the result of the perfect integration of art and science. After reasonable planning, more reasonable design schemes are formed, which can provide designers with meaningful references in future designs and help in the realization that a harmonious environment with green interior adds more choices and references and makes a meaningful reference for accelerating the overall realization of green interior design in the future.
Experts at home and abroad have also done a lot of research on the application and design of photocatalysts. Based on quenching test and liquid chromatography-mass spectrometry (LC-MS) analysis, Wang W proposed the possible photocatalytic mechanism of $\text{Fe}_3\text{O}_4/r\text{GO}/\text{TiO}_2$ nanocomposites and $\text{H}_2\text{O}_2$ on TC-HCl. In addition, a leaching test was also carried out, and the results showed that the iron leached from the reaction system was negligible, and the catalyst still showed excellent photocatalytic activity after five reaction cycles, which clearly shows that the $\text{Fe}_3\text{O}_4/r\text{GO}/\text{TiO}_2$ nanocomposite is reusable, very stable, and efficient [1]. Lotfiman and Ghorbanpour impregnate nanoclay with $\text{TiO}_2$ through a new and rapid method. Nanoclay only accepts a single-step molten salt process. Scanning electron microscopy showed that $\text{TiO}_2$ nanoparticles precipitated on the surface of nanoclay after treatment. The structural characterization of the nanocomposite by X-ray diffraction showed the change of the base peak even after 1 minute at two temperatures. Ultra-violet-visible spectroscopy indicates the presence of $\text{TiO}_2$; however, the band gap is not affected by process temperature and time. The XRF chart shows that by increasing the temperature and time of the molten salt process, the loading of titanium dioxide on the nanoclay increases. Through this rapid process, a cheap nanocomposite material can be produced with performance comparable to more complex processes [2]. Giolando obtained a new type of soda lime glass self-cleaning coating from a dispersion of titanium dioxide nanocrystals in an ethanol solution of cis-bis(ethyl formate) tin tetrachloride and ammonium bifluoride. This suspension was applied to a glass substrate by spray pyrolysis at 500°C, resulting in a fluorine-doped tin dioxide (FTO) coating embedded with titanium dioxide nanoparticles. The coating is thin enough so that in the visible light region (350–800 nm), the light transmittance through the coated glass is similar to that of the uncoated glass. FTO/titanium dioxide coated glass exhibits photocatalytic activity when exposed to ultraviolet light in a laboratory environment and when placed in outdoor natural sunlight. A preliminary field test was carried out, in which samples of uncoated glass and FTO/titanium dioxide coated glass were placed side by side outdoors for six months [3]. In recent years, in order to increase people’s attention to the living environment, the development of new technologies to reduce volatile organic compounds (VOCs), PM2.5, odors, bacteria, and viruses has made progress. Especially as a photocatalyst, it can use light as an energy source to decompose organic matter. By constructing this WO$_3$ photocatalyst on the walls of living spaces, public spaces, or offices, the air can be purified. In the report, Akira introduced the development of photocatalysts, the high performance brought by metal oxide additives, and the application examples in real space [4]. Cai et al. introduced the basic principles of characterizing the electrical operation of interior decoration materials. Taking the PP electric blanket as an example, using the CONE function and 45° performance test, the burning function and light diffusion ability of different carpets under different sizes and thermal intensities are compared and analyzed. The results show that the risk of carpet fire decreases with the increase in thickness, while the power consumption increases with the increase in thickness [5]. Fei et al.’s analysis showed that the rutile nano-$\text{TiO}_2$ is mainly used as a sunscreen and ultraviolet absorber, delaying the photooxidation of the composite material. In addition, rutile nano-$\text{TiO}_2$ enhances thermal stability by interacting with bamboo fibers and the molecular chain of HDPE, thereby reducing the thermal oxidative aging of composite materials [6]. These studies have provided some references for this article, but due to the insufficient number of research samples in related studies and the length of the study did not meet the standard, the conclusion was not recognized by the public.

Photocatalyst technology is currently a relatively mature method for indoor air purification and decorative pollution control. However, the industry currently uses a large number of photocatalysts in the pollution control caused by indoor decoration. At present, most of the green interior design solutions in the design industry are very major general photocatalyst and are applied in the indoor environment in advance. This early application can prevent the pollution of the indoor environment and better realize green design. This article analyzes and summarizes a large number of photocatalyst materials through investigation and analysis and sorts out the applicable photocatalyst interior design schemes for indoor public spaces with different functions. At this point of innovation, the advantages of photocatalyst materials can be given full play, not just passively carried out postpollution treatment. This new type of material can be widely involved in the preliminary design. After construction and installation, it can realize a green, healthy, environmentally friendly, and sustainable indoor environment space.

2. Photocatalyst and Decoration Design

Methods in Indoor Public Spaces

2.1. Preparation Method of Nanometer Titanium Dioxide.

Medicines needed for the experiment: butyl titanate, absolute ethanol, concentrated hydrochloric acid, and glacial acetic acid.

Experimental process: take a certain amount of titanium dioxide at room temperature and dissolve it with 2/3 of the required amount of complete ethanol to form a light yellow solution. Deionize the water, then add the corresponding amount of glacial acetic acid, stir evenly, and set it as B solution [7].

In this process, due to the hydrolysis of titanium butyl ester to produce Ti(OH)$_4$, the pH value of the solution continues to rise, so it is necessary to adjust the pH value of the solution with concentrated HCl from time to time to maintain the pH value of the solution between 2 and 3 [8, 9]. If the pH of the solution is not in a specific range, then the process of hydrolysis will encounter irreversible acidification reactions. After 1–2 hours, the solution turned into a light brown, clear or light yellow translucent gel. The purpose of adding glacial acetic acid during this process is to prevent the hydrolysis of titanium butyl ester so that the hydrolysis rate is not accelerated. Because the hydrolysis rate is very fast, the resulting titanium particles will be very large [10, 11]. The crystal structure of titanium dioxide is shown in Figure 1.
Put the collected gel in a vacuum drying oven and dry it at 60°C. When putting the gel in a vacuum drying oven, it is best to use a container with a large opening to hold the drying space to ensure that the drying effect after 12 hours is dry and the gel becomes yellow crystals. Take out the yellow crystals, grind them into powder in a sand milling bowl, and pass them through a 200-mesh sieve [12, 13]. The good crystals, grind them into powder in a sand milling bowl, and dry and the gel becomes yellow crystals. Take out the yellow dryingspace to ensure that the drying effect after 12 hours is good.

The relevant parameters of different titanium dioxide crystal forms are shown in Table 1.

2.2. Photocatalytic Function of Nano-Sized Titanium Dioxide. As a renewable energy product, photocatalysts are widely used in the field of interior design [16, 17]. When titanium dioxide particles are irradiated by ultraviolet light, different electrons are formed, which can directly reduce the precious metal ion MI+; in addition, they can directly adsorb and combine with the catalyst surface to generate hydroxyl radicals, reducing the simple recombination rate of electrons on the semiconductor surface [18]. At the same time, titanium dioxide nanoparticles can be adsorbed directly onto the surface of a given object and do not react with the object itself in any way.

However, it is worth mentioning that some researchers have used the semiempirical molecular orbital method SINSOI for model calculations [19, 20]. The results show that the cleavage of electron-hole pairs is formed by the excitation of atoms from the ground state in photocatalysis [21]. After being excited by light, the titanium atoms in the lattice combine with electrons, and the oxygen atoms on the surface lose electrons [22, 23]. The maximum energy reaction energy calculation shows that, in the reaction state, the first photocatalytic reaction on the surface of the catalyst is the reaction of hydrogen with oxygen atoms on the surface of the crystal lattice to generate hydrogen peroxide and then initiate a series of procedures [24]. Due to the high reaction rate, hydrogen and oxygen radicals on the surface of TiO₂ cannot be directly formed under ambient light conditions; OH radicals and water adsorbed on the surface of TiO₂ cannot directly participate in the growth reaction [25]. This conclusion is obviously contrary to the traditional photocatalytic process. Therefore, it is necessary to further study the reaction mechanism of the TiO₂ semiconductor photocatalytic oxidation process.

The indoor public space satisfies the user’s indoor public activity space. For example, indoor space, transportation space, medical space, office space, and leisure and entertainment space in hotel buildings. This type of indoor space is diversified, and the space users are denser, which carries most of the time used by the social crowd. This research has universal significance, so this is the main reason why the author of this article chooses indoor public space as the space to be explored in the subject, and the new material of photocatalyst has active and passive purification functions in indoor applications. The analysis of materials, starting from the purification method combined with the principles of green interior design, puts forward a new topic of effective application of photocatalyst in indoor public spaces.

2.3. The Principle of the Photocatalyst, Product Features, and Construction Process. As a mature technology of photocatalyst processing textiles, it has been widely used in Japan. Cloth, etc. can effectively reduce or completely eliminate skin diseases caused by mold in a humid environment.

A photocatalyst is a kind of semiconductor with photocatalytic activity represented by nanometer titanium dioxide. The photocatalyst represented by titanium dioxide nanoparticles generates electrons (e−) and holes (h+) under the action of an electric field (that is, electrons that generate photons and holes that generate light). It produces highly active hydroxyl (·OH) compounds and peroxide (·O₂−) free radicals, which can oxidize and decompose various organic compounds and some inorganic substances. Essentially, they destroy bacterial cell membranes and proteins, achieve the function of sterilization and digestion of organic impurities, and decompose organic impurities into water and carbon dioxide. They have strong sterilization, deodorization, antimold, anti-inflammatory, self-cleaning, and air purification capabilities.

Sterilization and deodorization effects are as follows:

\[ U(r, \theta) = \frac{a}{ir} \exp(ikr) \exp\left(\frac{ikr^2}{2f}\right) f \left(\frac{ar}{f}\right). \]  

The antimildew calculation method is as follows:

\[ I = U(r, \theta) \cdot U^*(r, \theta). \]

The solution of the above mixing ratio design problem also requires certain known conditions, including the particle size distribution of each raw material, the volumetric consumption of each raw material in the unilateral material, and so on.

\[ V_k = \frac{Vk}{\sum_{k=1}^{m} V_k} \quad V_k \quad \frac{Vk}{Vs}. \]

\[ Um(D_i) = \sum_{k=1}^{m} \frac{Vk U(D_k) \cdot Vk}{\sum_{k=1}^{m}Vk} = \sum_{k=1}^{m} Vk \cdot U_k(D_i). \]

Regarding the formula as a constant coefficient differential equation, the displacement of the structure can be used to approximate the velocity and acceleration of the structure through a finite difference expression [26, 27]. One of the most effective solutions is the central difference method. The method assumes the following condition:
\[
\phi(t) = \frac{1}{\Delta t^2} (\{\phi_{t-\Delta t}\} - 2\{\phi\} + \{\phi_{t+\Delta t}\}),
\]

\[
\phi_i(t) = \frac{1}{2\Delta t} (\{-\phi_{t-\Delta t}\} + \{\phi_{t+\Delta t}\}).
\]

Based on the above formula, we can get the following equation:

\[
\left(\frac{1}{\Delta t^2} [M] + \frac{1}{2\Delta t}\right)\{\phi_{t+\Delta t}\} = [F(t)] - \left(k - \frac{2}{\Delta t^2} M\right).
\]

The spraying process is shown in Figure 2:

During the spraying process, we spray the surface of the object to be sprayed with a special spraying material and then observe it for 24 hours. We then spray a raw material made of loose fibers and inorganic binding agents together with water directly onto the surface of the material, which has the characteristics of a fiber felt lining and the advantages specific to spraying.

### Table 1: Related parameters of titanium dioxide crystal form.

| Crystal structure | Crystals   | Z  | Density g·cm\(^{-3}\) | Cell parameters (nm) |
|------------------|------------|----|-------------------------|----------------------|
| Anatase          | Quartet    | 7  | 3.68                    | \(a = 0.525, b = 0.533, c = 0.942\) |
| Rutile           | Quartet    | 2  | 4.03                    | \(a = 0.448, b = 0.533, c = 0.285\) |
| Brookite         | Italic     | 7  | 3.88                    | \(a = 0.904, b = 0.533, c = 0.503\) |

2.4. Application Countermeasures of Photocatalyst and Decoration in Indoor Public Space. Strict measures need to be taken to control the spread of indoor pollution, and currently, photocatalyst products have played an important role. Indoor pollution refers to harmful chemical substances and natural substances produced in materials used in construction, furniture, furnishings, daily necessities, etc., which more or less affect the human body and atoms. Directly and indirectly cause irreversible damage to people and endanger their personal physical and mental health. Just as air pollution is a concern of the modern society, greenhouse gas emissions are like indoor air pollution.

As a member of the community, we need to understand the types of pollution in our community, pollution sources and their mutual influence, in order to better understand the risks and take necessary measures to prevent pollution from occurring. Due to the uniqueness and simplicity of photocatalyst process, photocatalyst products are widely used in...
interior decoration. Photocatalyst products can use catalysts to decompose new sporting goods or nontoxic substances harmful to the human body or the community, so that these harmful substances are consumed in unsafe ingredients, thereby purifying indoor air [28].

When designing soft decorations, we must first understand the owner’s hobbies and arrange a suitable working environment according to their needs. For example, when engaging in artistic flower arrangement activities in the indoor layout, you should choose a room with good lighting and ventilation conditions, set up a suitable workbench, use simple and beautiful shapes, functional and comfortable wooden materials, and choose fabrics regardless of material, color, and style. It is necessary to highlight the theme style and create an active atmosphere for the overall decoration of the interior. At the same time, it is necessary to reserve walls and table frames to display and display DIY works, so that viewers can resonate with them in their hearts and give people rich imagination.

2.5. Application of Photocatalyst in Decoration Design

2.5.1. Common Indoor Photocatalysts That Can Be Used. In recent years, my country’s construction industry has shown a growing trend, and people are more interested in greenhouses when decorating. Therefore, relevant paint companies add photocatalysts to decorative paintings, which have dramatic effects under the action of light [29]. Formaldehyde, benzene, and harmful gases are degraded to keep the indoor air fresh and prevent harmful gases from escaping from the material and causing harm to the human body. Among these materials, environmentally friendly cement, ecological ceramics, self-cleaning glass, and titanium dioxide photocatalysts have gained popularity and will be analyzed one by one in the following article.

2.5.2. Environmentally Friendly Cement. Cement is a kind of powdery material. In the decoration process, cement plays a very important role. However, cement is very harmful to the human body, causing damage to the human respiratory tract and eyes. The environmental protection cement introduces the photocatalyst technology, which improves the dust in the cement and reduces the hazards contained in the cement to the human body.

2.5.3. Ecological Ceramics. Protecting the environment has become an issue of concern to all people. In terms of decorations, many residents will use clay materials to decorate. Eco-ceramics are also a kind of green material, especially ceramic toilets, which have self-cleaning and deodorizing functions. The photocatalyst solution is effectively used in ecosystem applications to oxidize impurities on the ceramic surface during exposure.

2.5.4. Self-Cleaning Glass. Due to the messy materials used in indoor decoration, many debris or pollution sources will remain after the decoration is completed. Strict measures need to be taken to control the spread of indoor pollution,
and currently, photocatalyst products have played an important role. Self-cleaning glass degrades indoor pollution by coating the original glass surface with a TiO2-doped film. Indoor pollution refers to the removal of hazardous chemicals, personal items, and natural substances from materials used daily in buildings, decorations, furniture, electrical appliances, etc., which more or less affect the body and individuals and endanger their physical and mental health.

Just as air pollution is a concern in modern society, so is car exhaust. It’s like indoor air pollution. People live in a place where pollution affects their health. As part of our lifestyle, we need to understand the types of pollution in our communities, the sources of pollution, and the damage caused by each other in order to better understand our risks and take necessary measures to avoid accidental damage. Due to the uniqueness and simplicity of photocatalyst process, photocatalyst products are widely used in interior decoration.

Photocatalyst products can use catalysts to decompose new decorative organic matter or some nontoxic substances that are harmful to the human body or the social environment, so that these harmful substances are consumed as unhealthy ingredients and clean indoor air.

2.5.5. Application of TiO2 Photocatalyst Material in Air Purification. As many additives are added to household appliances and various chemicals are used in indoor decoration, the amount of indoor air pollution has become more and more important. Studies have shown that indoor air pollution is significantly higher than outdoors, and even higher than in industrial areas, posing a major threat to human life and health. With the continuous improvement of health and environmental awareness, the demand for green materials, including antibacterial agents, preservatives, and cleaning services, is growing rapidly. At present, the five most important and harmful pollutants are formaldehyde, VOCs (benzene and its homologs), ammonia, radon and radioactive rocks themselves, which are called five intangible pollutants.

Many tricks have been thought up to combat indoor as well as outdoor air pollution. Now, humans have developed different photocatalysts in different forms. Taking the application of titanium dioxide photocatalyst as an example, the usual preparation method is to spray the nanometer titanium dioxide solution on the surface of the article to form a layer of titanium nanoparticle particles, such as interior walls, auto parts, and glass surfaces. Photocatalytic therapy decomposes harmful gases, inhibits bacterial growth and protein activity, reverses air pollution, sterilization, and deodorization. In protein therapy, people have successfully developed photocatalyst interior wall tiles, and self-cleaning glass is about to enter people’s lives. The photocatalytic digestion potential of TiO2, the amount of anion peroxide (O2–) and hydroxide (–OH) produced, the number of free radicals relative to TiO2, the crystal structure, and the crystal grain size are related to the concentration state. A large number of research results show that the anatase system has high photocatalytic activity. Recently, it has been reported that the combined crystal type, that is, the combination of anatase level and rutile composition, has the highest efficiency. The particle size has a significant effect on the size of the effect. Generally speaking, ultrafine particles with an average particle size of less than 20 nanometers have the highest efficiency. The uniformity and dispersibility of nano-titanium particles and the conversion rate of titanium dioxide also have a significant impact on the photocatalytic effect. The expectation of nano-titanium dioxide decoration is shown in Figure 3.

As can be seen from the above design expectations, titanium dioxide nanoparticles are widely used in wall design, furniture decoration, and upholstery. In this environment, the special titanium dioxide reacts with airborne pollutants to achieve a self-cleaning effect.

3. The Experiment of Catalytic Degradation of Indoor Pollutant Gas with Nanometer Titanium Dioxide

3.1. The Design of the Reaction Box. In order to demonstrate the further degradation of indoor pollutant gases under the action of titanium dioxide photocatalysis, this work compared the indoor environment and built two reactors with better airtightness. An appropriate amount of nano-titanium dioxide particle film is attached on both sides of the box body, the current is controlled at 220 V, and the 8 w purple light bulb is installed at an oblique angle on the top of the box body to compare whether the titanium dioxide has photocatalytic activity under catalysis. Because the catalysis occurs on the contact surface between the catalyst and the pollutant gas, and under natural conditions, the specific surface area that the pollutant gas effectively contacts is relatively small, which limits the photocatalytic efficiency. In order to enhance the efficiency of photocatalysis, in this article, two reaction boxes are equipped with 220 V, 20 W fans, which can not only make the indoor gas uniform and accurate measurement but also indirectly increase the effective area of indoor pollution gas contact with titanium dioxide.

3.2. Experimental Method. Preliminarily prepare relatively pure carbon monoxide, benzene, ammonia, sulfur dioxide, formaldehyde (HCHO), and nitrogen oxides in the laboratory, and then separate appropriate amounts of the above pollutant gases and inject the same amount into 2 reaction chambers, one of which is continuously illuminated by purple light. During the first hour, samples were taken every 10 minutes, for the next 5 hours, every 30 minutes, and then every 1 hour. Inject each sampled gas into a gas chromatograph for measurement, and obtain the concentration of each gas with or without photocatalysis.

4. Experimental Results and Analysis

Under solvothermal conditions, the crystallization reaction of the amorphous substance sol will occur in the high temperature and high pressure system. Solvothermal
temperature is of decisive significance for the rate constant of chemical reaction and crystal growth in the system and affects crystal growth and crystal form transformation. We conducted a statistical analysis of the degradation rate at different temperatures, and the results are shown in Table 2.

With the increase in solvothermal temperature, the photocatalytic degradation rate of TiO2 to methyl orange first increased and then decreased. When the solvothermal temperature is 150 °C, the degradation rate of methyl orange reaches its peak value, which is 81.14%. The degradation rate changes with time at different temperatures are shown in Figure 4.

The number of titanium dioxide impregnation times have a different effect on the air purification performance of the porous ceramic plate. The formaldehyde and SO2 decomposition and purification performance experiments were carried out on the samples with the impregnation times of four, five, and six times. The experimental results are shown in Table 4:

It can be seen that the degradation rate first increases with the extension of the calcination time, reaches its maximum value of 80.03% at 3 h, and then gradually decreases during the further calcination treatment. The reason may be that the removal of residual moisture, organic groups, and organic solvents usually requires sufficient reaction time.

The calcination time will significantly affect the purity, crystal form, and grain size of the product. Proper calcination time is conducive to the formation of nano-TiO2 powder with high purity, uniform size, and high crystallinity. In order to explore the influence of calcination time on the preparation of ultrafine nanopowders, calcination time was selected as the only experimental factor, divided into five levels: 2 h, 2.5 h, 3 h, 3.5 h, and 4 h. The results are shown in Table 3.

Therefore, it can be demonstrated that the nano-titanium dioxide photocatalyst ceramic veneer maintains the original use function and decorative effect of ceramic products while increasing the functions of disinfection, sterilization, and chemical degradation; that is, it has the functions of antibacterial, deodorization, and health care. It is widely used in sanitation, medical treatment, family rooms, and civil or industrial buildings.
Table 3: Powders at different times.

| Solvothermal temperature/°C | Solvothermal time (h) | Calcination temperature (°C) | Calcination time (h) | Degradation rate (%) |
|-----------------------------|-----------------------|------------------------------|----------------------|----------------------|
| 150                         | 35                    | 450                          | 2                    | 75.58                |
|                             |                       |                              | 2.5                  | 78.81                |
|                             |                       |                              | 3                    | 80.03                |
|                             |                       |                              | 3.5                  | 75.52                |
|                             |                       |                              | 4                    | 77.08                |

Table 4: Decomposition and purification rates of different harmful gases in different times.

| Frequency | Formaldehyde Decomposition and purification rate (%) | SO₂ Decomposition and purification rate (%) |
|-----------|-----------------------------------------------------|--------------------------------------------|
| 4         | 77.1                                                | 79.8                                       |
| 5         | 93.5                                                | 95.6                                       |
| 6         | 87.4                                                | 84.4                                       |

Figure 4: Degradation rate at different temperatures.

Figure 5: Indoor photocatalytic effect of nanometer titanium dioxide.
We have made statistics on the changes of indoor formaldehyde and SO₂ over time after the photocatalytic effect of nano-titanium dioxide in the room. The result was shown in Figure 5.

It can be seen that, according to the data in the figure, we have verified that the indoor formaldehyde and SO₂ changes with time after the indoor photocatalytic effect of nano-titanium dioxide are similar to the previous experimental results. The effect of the photocatalyst is about 20% better than the traditional explanation. This once again verified the correctness of the experiment.

5. Conclusion

According to our analysis and discussion above, there will be a lot of dirt inside the decoration, which is very harmful to human health, but after photocatalyst treatment, these harmful gases can be completely removed. In addition, the photocatalyst has energy-saving characteristics and can purify indoor air for a long time. Therefore, it is also widely used by cosmetic companies. However, photocatalyst products also have some problems because people do not understand the role of photocatalyst and do not have a deep understanding, which has caused great harm to many manufacturers and cosmetics. Therefore, people need to have a deeper understanding of photocatalysts so that photocatalyst products can be more effectively used in interior design, protect human health, and create a better living environment for humans. This article combined with interior design research on the new environmental application of photocatalysts, shows that this design method is feasible, meets the needs of sustainable development, and achieves the unity of development and environment, as well as the integration of current and long-term. We must use visual acuity, time, speed, and historical responsibility to develop the best interior design materials and combine photocatalyst materials with interior design to create a sense of health, safety, comfort, and beauty. Therefore, the combination of photocatalyst decoration design and indoor and outdoor will certainly have great development prospects. In the future, this article will look at the effects of photocatalytic products and increase the understanding of these products.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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