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Retraction

Retracted: Innovative Application of Nano-Organic Photochromic New Materials in Hakka Traditional Decorative Pattern Design

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] H. Lai, "Innovative Application of Nano-Organic Photochromic New Materials in Hakka Traditional Decorative Pattern Design," *Advances in Materials Science and Engineering*, vol. 2022, Article ID 1055969, 12 pages, 2022.

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Research Article

Innovative Application of Nano-Organic Photochromic New Materials in Hakka Traditional Decorative Pattern Design

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Hakka traditional decorative patterns are the epitome of local life and production customs, politics and economy, culture and art and other history and culture. The themes of Hakka traditional decorative patterns come from the real world or the imaginary world, expressing the expectation and beautiful vision of life. At the same time, it is also the essence of artists accumulated through life in the past dynasties, which has a certain impact on the integration of modern art design and traditional culture. Photochromic materials have the characteristics of reversible color change under the action of light. They have relevant applications in many fields, such as architecture, currency anti-counterfeiting, clothing decoration and so on. Firstly, this paper briefly expounds the Hakka traditional culture. According to the introduction of Hakka traditional culture, this paper leads to the design of Hakka traditional decorative patterns based on Hakka traditional culture, and discusses the decorative technology, decorative parts, application scope and development history of Hakka traditional decorative patterns. Secondly, this paper briefly summarizes the photochromic materials, and leads to the category, principle and mechanism of organic photochromic materials. In this paper, electrospinning technology is introduced, and relevant experiments are designed. The results show that the composites with MAPE have better flexural, compressive and impact strength when the length of carbon nanofibers changes consistently. In the bending performance comparison experiment, the experimental data show that the lowest value of the group with MAPE is 15MPa higher than the highest value without MAPE. In the comparative test of compressive properties, the experimental data show that there is a difference of 30MPa between the composites with MAPE and those without MAPE. Moreover, when the length of carbon nanofibers is 40um, the overall performance of the composites is the best. This paper takes the design of Hakka traditional architectural decoration pattern with nano organic photochromic new materials as an experiment. Experiments show that nano organic photochromic new materials have better properties than traditional building materials in flexural modulus, compressive modulus and thermal stability.

1. Introduction

In today's diversified world culture, traditional culture is constantly impacted and integrated by foreign culture, and a considerable part of traditional culture with historical value is gradually forgotten by people. This has also aroused people's vigilance and gradually aroused people's re cognition of traditional culture. As a part of Chinese traditional culture, Hakka traditional decoration culture has certain research value. Traditional decoration is designed and made based on traditional methods, but with the development of society and the improvement of various skill levels, the traditional production methods are gradually improved and replaced. Traditional decoration has certain limitations in color and technology. The color of products is often single and unified. In practical application, in addition to beauty, it is also necessary to consider the efficacy and environmental protection function of the materials used. Therefore, more consideration should be given to the selection of materials. Photochromic materials have obvious optical activity. Its color changes under the irradiation of specific wavelength and intensity electromagnetic energy. Therefore, in the process of use, it can not only meet the demand for beauty, but also realize environmental protection. Therefore, in the field of decorative materials, photochromic materials emerge as a new research direction. Organic photochromism is widely used in dyes, holographic projection and so on, while organic photochromic materials with metal nanoparticles are favored by researchers because of their excellent properties in the application of metal films.

Hakka traditional decorative patterns have a long history and have different characteristics in different historical stages. The shapes and colors that have spread over the years are the cream of the fusion of thousands of years. They are rich in cultural connotation and artistic achievements. This paper studies the new materials of Hakka traditional decorative pattern design, and combines traditional culture with modern technology. On the one hand, it carries forward the traditional decoration culture from the perspective of the characteristics of the times of urban construction and human settlement environment optimization. On the other hand, it has certain practical significance to apply modern technology in different fields to promote the development of modern technology. The research and application of nano organic photochromic new materials provide a theoretical and practical reference for the selection of environmental protection materials. Finally, it will further expand the application field of nano organic photochromic new materials. It can promote the development of nano organic photochromic materials.

The innovation of the article lies in: (1) this paper introduces the traditional decorative patterns of Hakka under the background of the integration of local characteristics and culture, which reflects the long history of Chinese traditional culture. At the same time, it is conducive to the dissemination of Hakka traditional culture. (2) In this paper, nano organic photochromic new materials are applied to Hakka traditional decoration, which provides a useful reference for the design of decorative pattern materials integrating regional culture in other places.

2. Related Work

Hakka traditional decoration is mostly embodied in brick carving, wood carving, stone carving and other processes in traditional buildings. These sculpture processes are mainly carried by walls, column beams, eaves, roofs and column foundations. In the theme design of decorative patterns, there are mainly flowers and fruit trees, auspicious birds and animals, abstract symbols and opera characters. The decoration theme is mainly based on the expectations of Hakka people: peace and health, praying for children to prolong life and great wealth. Hakka traditional decoration mainly focuses on printing and dyeing, embroidery and silver decoration, supplemented by cloth pasting, hollowing and other technologies. From the perspective of decoration theme, Hakka traditional decoration not only has practical function in structure, but also has the cultural function of transmitting information.

Photochromism mainly refers to the change of the structure of the compound and the formation of another compound when irradiated with light of a specific wavelength. The compound returns to its original structure when the light of a certain wavelength or some pressure acts on the changed compound [1]. Photochromic materials have played a role in many fields [2], such as anti-counterfeiting technology, optical information storage, self developing full information recording and photography technology, military and biological fields. Photochromic materials can be obtained by post polymerization surface modification of a variety of polymers [3]. Nakano H produces photochromic molecular materials by spin coating. He found that the photochromic amorphous molecular material film based on azobenzene showed reversible phase separation resolution through heat treatment [4]. Sergey studied the preparation of high-purity composites and nano materials with photoactive compounds, and summarized the physical properties of organic photochromic ions [5], indicating that nano organic photochromic new materials are also in the research scope of researchers. Lanthanide (III) ion (LN (III)) sensing has a broad prospect in clinical, biological and environmental research, but the recognition of Ln (III) ion in this kind of compounds has some limitations, such as expensive instrument and long analysis time. LZ Cai studied the use of photochromic visual recognition of lanthanide (III) ions (LN (III)) [6]. Photochromic dye-sensitized solar cells (DSSC) can be used to construct integrated photovoltaic devices. Riquelme A J combined with electrical impedance spectroscopy (EIS) and intensity modulated photostreamer spectroscopy (IMPs) to comprehensively characterize the photochromic dye NPI of DSSC. It further verified that the inherent characteristics of photochromic dyes can change the function of solar cells to a certain extent [7]. Topbas O studied two different photochromic dyes with high heat in intelligent and functional textiles by means of condensation method and in-situ polymerization. He compared and analyzed the properties of photochromic dyes from the aspects of structural morphology, particle size distribution and maximum absorbance, and came to the conclusion that photochromic dyes have obvious advantages in performance [8]. YF Han believes that photochromic materials are also very suitable for color indicators. Experiments have proved that different group modifications and metal coordination modes can obtain different color changes [9]. The above research is not very persuasive, however.

3. Overview of Hakka Traditional Decorative Pattern Design and Nano-Organic Photochromism

3.1. Hakka Traditional Decorative Pattern Design. As a part of Chinese traditional decorative culture, Hakka traditional decorative pattern design is naturally influenced by Chinese traditional culture. The Hakka people are from the Central Plains and subordinate to the Han nationality. Therefore, the traditional Hakka decorative pattern design technique also comes from the Central Plains. According to the artistic language, the traditional decoration in the Central Plains is generally divided into auspicious pattern decoration, flower and bird pattern decoration, geometric pattern decoration and so on. Hakka pattern decoration is reflected in architecture and clothing. In terms of architectural decoration technology, there are decoration techniques for doors and windows, walls and eaves, as shown in Table 1 for specific decorative art characteristics.

As a cultural benchmark with regional characteristics, Hakka traditional clothing is also of great significance in the design of clothing decoration. The patterns and designs of Hakka traditional costumes are mainly reflected in women's and children's costumes, which are full of Chinese traditional auspicious meanings. Table 2 shows the artistic characteristics of Hakka traditional clothing decoration.

Hakka traditional decoration is partly reflected in architecture and partly in clothing. Hakka traditional decoration, whether architectural decoration or clothing decoration, pattern design is essential. Hakka traditional decorative patterns are also developed in combination with the characteristics of Chinese traditional culture. Table 3 shows the development process of Hakka traditional decorative pattern design.

The style of Hakka residential buildings is mainly hall house combination and enclosure. The architectural decoration is rich and has local characteristics. The decorative styles created by different decorative processes are also different. Figure 1 is the real picture of the decorative pattern design of Hakka traditional buildings.

The decorative pattern design of Hakka traditional costumes also focuses on auspicious elements such as characters, animals and plants and geometric figures to express the longing for a better life. The decoration of Hakka traditional clothing is mainly reflected in aprons, sleeves, fancy cloth shoes, headwear, etc. Figure 2 shows the real picture of the decoration pattern design of Hakka traditional clothing.

3.2. Overview of Nano-Organic Photochromic Materials. Photochromic materials mainly refer to a kind of materials that produce chemical reaction and color change under the irradiation of specific wavelength light. Photochromic materials are divided into organic photochromic materials and inorganic photochromic materials [10]. Table 4 shows the commonly used photochromic materials and their action mechanism.

Assuming that P represents a substance that can exist stably under certain conditions, irradiate substance P with light of a specific wavelength. Under the action of light, the chemical structure of substance P changes and is transformed into substance Q which exists stably and has different colors under certain conditions. When substance Q loses energy excitation, it will change back to substance P, which is an approximate photochromic change process. The image change of this process is shown in Figure 3. When the compound receives radiation stimulation, the structure changes, resulting in color change. When the radiation

Table 1: Characteristics of Hakka traditional architectural decoration art.

Decorative parts	Decorative theme	Decorative techniques
Beam frame	Figure gods	Wood carving art
Plinth	Auspicious birds and auspicious animals	Stone carving art
Platfond	Plant flowers	Brick carving art
Doors and windows	Treasure artifacts	Grey sculpture
House ridge	Text symbols and geometry	Color painting art

Table 2: Decorative art features of Hakka traditional costumes.

Category	Classification	Moral
Theme selection	Word, Plant flowers, Text symbols and geometry	Prosperity and many children
Color	Blue, Black, Gray, Red	Natural harmony
Material	Ramie , Cotton	Simplicity
Aesthetic characteristics	Symmetrical unity and Harmonious	Auspicious

Table 3: Development process of Hakka traditional decorative pattern design.

period	Pattern design	Characteristics
Neolithic	Dot pattern, water ripple, rotation pattern, circle pattern, mesh pattern, etc	Neat and smooth, structured and varied
Shang and Zhou dynasty	Bird pattern, fish scale pattern, elephant pattern, cicada pattern, beast pattern, etc	It's bound by the straight line norm
Spring and autumn and Warring States Period	Fishing and hunting patterns, Panlong patterns, pan li patterns, etc	Unified, complex and messy
Qin and Han Dynasties	Echo, checkered, moire, etc	Square belt round, smooth and steady
Wei jin Southern and Northern Dynasties	Lotus pattern, flying pattern, honeysuckle pattern, dragon and phoenix pattern, etc	Buddhist stories
Tang and Song Dynasties	Treasure pattern, twining, flower and bird pattern, roll grass pattern, etc	Full and round and beautiful
Yuan, Ming and Qing dynasties	A pattern that combines with each other, such as a bird with a flower, an insect with a flower	On the basis of the existing decorative patterns, the advantages of foreign ethnic patterns were added
modern	Moire, twine flower and bird, roll grasspattern, etc	On the basis of modern aesthetic concept and understanding of its cultural connotation, the design elements are recreated

Figure 1: Real map of Hakka traditional architectural decoration pattern design.

Figure 2: Real picture of decorative pattern design of Hakka traditional clothing.

stimulation disappears, the structure changes inversely to form a circular shape.

Photochromic materials were discovered by researchers as early as 1867. It was not until 1950 that the concept of photochromism was defined by researchers. The first use of photochromic materials was in 1970. Compounds with photochromic properties were applied to military clothes in the United States. Organic photochromic materials are a

Table 4: Commonly used photochromic materials and their action mechanism.

sort	Photochromic materials	Mechanism of action
inorganic	WO3, MoO3, TiO2, CaTiO3+(Ni, Mo), (PLZT+Fe2O3), CaF2+(La, Ce), (Tb, Cd), SrTiO3+(Fe, Mo), (Ni, Mo) AgX(X=Cl, Br, I)+TlCl, CdO As-Se(S), Ge-Te-X (X=Sb, S) Ferrocyanide	WO3+hv ↔ W5+(O-)(O2-)2 Ni2+Mo6+hv ↔ Ni3+Mo5+ n(AgCl)+hv ↔ (Ag)n+nCl Photocrystallization blackening M4+Fe42+[Fe2+(CN)6]3=Fe43+[Fe2+(CN)6] 3+4M+4e-
organic	Spiral pyran, aniline or Schiff base, sulfone, osazone, ammonia Thiourea, astragalus derivatives, succinic anhydride	The breaking and combination of double bonds, the formation of isomers

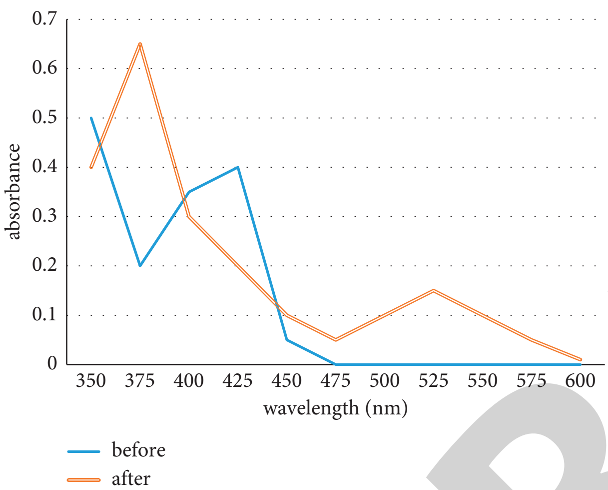

Figure 3: Photochromic change process diagram.

type of photochromic materials. They can also be roughly divided into two kinds. One is organic compounds represented by spiropyran, napyran and pyrazolone [11]. These compounds will change color under ultraviolet or visible light irradiation, but they can automatically return to the original color when they lose the function of light source [12, 13]. The other is organic compounds represented by diaryl ethylene and captive arginine anhydride. After the color change of these compounds under the action of light, it is necessary to restore the color through the action of another light source [14, 15]. The principle of organic photochromism is shown in Table 5.

Nano organic photochromic materials refer to making organic compounds into nanoparticles, or adding nanoparticles such as metal nanoparticles, nano silver and nano titanium dioxide into organic photochromic materials to make composites [16, 17]. Metal nanoparticles in nano organic photochromic materials will cause collective electron oscillation on the surface of metal nanoparticles under the action of light radiation [18]. When the metal surface is not transparent, the reflectivity formula of light incident on the metal surface is:

$$\mathrm{Re} = \frac{(1 - Ri)^2 + E^2}{(1 + Ri)^2 + E^2}. \tag{1}$$

Table 5: Principle of organic photochromism.

Representative compound	metachromatic principle
Azobenzene, indigo, styrene, benzylidene aniline, etc	Photoisomerization (cis-trans isomerization)
Spiropyran, hydrosperic anhydride, spirothiran, spiroperazine and their derivatives	A vision of the key
Bis - tetraphenyl pyrrole, tetrachloronaphthalene, hexaphenyl ethane, hexaphenyl bis imidazoles, hydrazine and other symmetrical compounds	Homolytic cleavage of bonds (free radical formation or dissociation)
Thick ring aromatic compounds, anthraquinone, violet essence compounds, thiazobenzene derivatives, violet protochrome, tetraphenylhydrazine and other compounds	redox reaction
Anhydride and its derivatives, aryl and pyran, diaryl ethylenes, aryl and oxazines, etc	pericyclic reaction
Salicylaldehydes anilines (Schiff bases)	Proton transfer
Aryl naphthalene and naphthalene quinones	Aryl migration

R_i represents the refractive index (Quantitative under specific conditions) of the metal surface and E represents the extinction coefficient of the metal surface. When the incident light of a certain wavelength is vertically incident on the metal reflective film from air, its extinction coefficient is determined. The reflectivity of most metal surfaces is high in the infrared region and low in the ultraviolet region. r is the radius of metal nanoparticles, D is the electron density, e is the surrounding media dielectric constant, γ is the wavelength of incident light, and the calculation formula of extinction cross section of spherical metal nanoparticles is:

$$E_s = \frac{24\pi^2 r^3 De^{3/2} e_a}{\gamma (e_r + 2e)^2 + e_a^2}. \tag{2}$$

Extinction cross section of metal nanoparticles in theoretical modeling, the calculation of extinction cross section of nanoparticles with different shapes is also different. v represents the volume of nanoparticles, Q is the depolarization factor, and the calculation formula of extinction cross section of long strip metal nanoparticles is:

$$E_s = \frac{2\pi v De^{3/2}}{3\gamma}\sum\left\{Q^2\cdot e_a\left[e_r+\left(\frac{1-Q}{Q\cdot e}\right)^2+e_a^2\right]\right\}^{-1}. \tag{3}$$

The refractive index calculation formula of the material is:

$$Ri = \sqrt{e}. \tag{4}$$

M is the number of polarized molecules, h is the polarizability, and the dielectric constant of the material is calculated as follows:

$$e = 1 + 4\pi Mh. \tag{5}$$

The resonance enhanced electric field inside the nanoparticles will excite the dipole field outside the nanoparticles. When the nanoparticles are larger, it will excite the multistage mode. Therefore, the number of polarized molecules and polarizability need to be considered. Polarizability represents the deformation degree of electron cloud, and the standard formula of polarizability is:

$$h_\gamma = 4\pi e_\gamma r^3\frac{e-e_\gamma}{e+2e_\gamma}. \tag{6}$$

When nanoparticles are made in composite materials, that is to say, loading nanoparticles in n thick films, the polarizability is expressed as:

$$h_\gamma = 4\pi e_\gamma (r+n)^3\frac{e\cdot e_\gamma^T - e_\gamma\cdot e_\gamma^R}{e_\gamma^n\cdot e_\gamma^T + 2e\gamma\cdot e_\gamma^R}. \tag{7}$$

Adding depolarization factor Q, and the calculation formula of relevant variables in formula 7 is:

$$\begin{aligned} e_\gamma^T &= e\cdot(3-2Q)+2e_\gamma^n\cdot Q,\\ e_\gamma^R &= e\cdot Q + e_\gamma^R\cdot(3-Q). \end{aligned} \tag{8}$$

The calculation formula of depolarization factor under this model is:

$$Q = 1-\left(\frac{r}{r+n}\right)^3. \tag{9}$$

The change of reflectivity will also cause the frequency change of electron oscillation on the surface of metal nanoparticles [19], and this change of reflectivity is also changed under different depolarization factors Q [20–22]. According to the reflectivity calculation formula, it is deduced that when the reflectivity is the smallest, the approximate relationship function between reflection angle and reflectivity is expressed as:

$$\begin{aligned} \mathrm{Re}_{Q\min} &= \left(\frac{E}{Ri\left(\sqrt{1+E^2/Ri^2}\right)}\right)^2,\\ \alpha &= \frac{1}{\cos\left(\left[1+4/\left(Ri^2+E^2\right)\right]^{1/2}-1/\left[1-4/\left(Ri^2+E^2\right)\right]^{1/2}+1\right)^{1/2}}. \end{aligned} \tag{10}$$

The calculation formula of depolarization factor Q under a certain length is:

$$Q_{Le} = \frac{1-m^2}{m^2}\left[\frac{1}{2m}In\left(\frac{1+m}{1-m}\right)-1\right]. \tag{11}$$

The calculation formula of depolarization factor Q under a certain width is:

$$Q_{Wi} = \frac{1-Q_{Le}}{2}, \tag{12}$$

m represents the ellipticity, and the formula for m is:

$$m = \sqrt{1-\frac{1}{(Le/Wi)^2}}. \tag{13}$$

Le and Wi respectively represent the length and width of metal nanoparticles under certain conditions. With the increase of the environmental dielectric constant, the spectrum will show a red shift. The expression of the size of the red shift or the scattering wavelength of metal nanoparticles is:

$$\gamma_{\max} = u\Delta Ri\left[1-e\left(\frac{-2n}{w_e}\right)\right]. \tag{14}$$

Among them, u represents the sensitivity factor of nanoparticles and w_e represents the attenuation length of characteristic electromagnetic field.

For compounds, the refractive index is related to the properties of compounds. Generally speaking, the refractive index of electronic bond compounds is higher than that of ionic bonds, and the stacking index (That is, the bulk density of metal film) of metal films will also affect the refractive index. The corresponding calculation formula between the two is:

$$M = \frac{\left(Ri_a^2-1\right)\cdot\left(Ri_b^2+2\right)}{\left(Ri_a^2+1\right)\cdot\left(Ri_b^2-1\right)}. \tag{15}$$

Among them, Ri_a represents the refractive index of the film and Ri_b represents the refractive index of the material.

It is found that the electric field of metal nanoparticles will be enhanced at the tip or sharp place of the structure, and the locally amplified electric field will enhance the localization of fluorescence [23, 24]. Under this condition, the expression of fluorescence emission power of nanoparticles is:

$$f = E_y \cdot \mu \cdot \rho. \quad (16)$$

Among them, E_y represents the absorption cross section. The luminous flux is proportional to the square of the electric field intensity, μ represents the photon flux, and ρ represents the quantum yield. The expression of quantum yield is:

$$\rho = \frac{\sigma}{\sigma + V_r}. \quad (17)$$

In formula (17), V_r represents non radiation rate, σ is a variable parameter, and the radiation rate is related to environmental parameters. When different metal nanoparticles are added, the radiation rate is different. Therefore, there is another expression for quantum yield:

$$\rho = \frac{\sigma + \sigma_t}{\sigma + \sigma_t + V_r}. \quad (18)$$

The optical thin film structure in optical color changing materials is divided into dielectric layer, metal reflection layer and metal absorption layer. The metal reflection layer is a symmetrical central layer, and the two sides are a dielectric layer and a metal absorption layer respectively. Optical thin film materials are composed of multilayer nano film structures. Therefore, in practical use, it is necessary to consider not only the absorption between layers, but also the reflectivity of the reflective layer.

3.3. Electrospinning Technology. Electrospinning technology is a simple method to produce nano materials. Its principle is to prepare nano polymer fibers by using electric field force [25]. Whether natural or synthetic polymers, they can use this technology to prepare nanofibers [26]. Nowadays, electrospinning technology has been used in nano catalysis, biomedicine, protective clothing, biotechnology, national defense and other fields, as shown in Figure 4.

Electrospinning devices are divided into high-voltage devices, spraying devices and receiving devices. Electrospinning technology can be used to prepare continuous and uniform long nanofibers [27]. Moreover, electrospinning technology is not only used in laboratory research, but also suitable for large-scale industrial production. In this paper, electrospinning technology is used to make nanofibers. The flow chart is shown in Figure 5.

In this paper, the spinning solution with appropriate concentration is first configured in the syringe, then the spinning parameters (including voltage, flow rate, external air humidity and other variables) are controlled for operation, and finally the produced nanofibers are processed for prognosis.

4. Experimental Nano–Organic Photochromic Materials

4.1. Experimental Properties of Carbon Nanofiber Photochromic Wood Plastic Composites. In this paper, two groups of matched single screw extruders are used to match the core melt and shell melt into the cooling molding die, so that the prepared wood plastic composite has core-shell structure. Composite materials are divided into shell materials and core materials. The core layer materials are wood flour, high density polyethylene (HDPE), maleic anhydride grafted polyethylene (MAPE) and polyethylene wax (pe-wax). The shell materials are organic photochromic powder, carbon nanofibers, high density polyethylene (HDPE) and maleic anhydride grafted polyethylene (MAPE), as shown in Figure 6 for the specific proportion of two layers of materials.

As can be seen from the figure, three different values of HDPE and carbon nanofibers in the shell material were selected to make composites for experiments. Three groups of experiments were carried out. The specific experiments will be divided into two groups with and without MAPE to test the flexural, tensile and impact strength of the composites when different lengths of carbon nanofibers are used.

In this paper, the bending resistance of the experimental group with MAPE is obviously stronger than that without MAPE. As can be seen from Figure 7, with the addition of carbon nanofibers, the bending properties of the composites continue to change. When the length of carbon nanofibers used is 40um, the bending performance is the best. The lowest value of the group with MAPE is 15MPa higher than the highest value without MAPE, which is enough to show that the role of MAPE is very obvious.

It can be seen from figure 8 that when MAPE is used in the composite, the length of carbon nanofibers is between 40 and 60, and the tensile performance of the composite is the best. The overall compressive properties of the composites with MAPE are much stronger than those without MAPE, and the difference between the highest values of the two is 30MPa.

According to the data in Figure 9, it can be seen that when the length of carbon nanofibers is 40um, the impact strength performance of composites with MAPE is the best. However, the impact strength performance of the experimental group without MAPE is the worst at this time, and the difference between the two highest values is 10kj / m ^{2}.

According to the experimental data, the composites with MAPE have stronger properties in compression, bending and impact strength, which shows that carbon nanofibers can enhance the physical properties of wood plastic materials. Moreover, maleic anhydride grafted polyethylene contributes to the combination between carbon nanofibers and wood plastic materials, making the properties of the materials more stable and prominent. According to the data of three groups of experiments, when the length of carbon nanofibers is 40um, the properties of the composites are the most stable.

4.2. Performance Experiment of Doped Nano–Silica Organic Composite Photopolymer Materials. Spiropyran compounds were used to synthesize organic photochromic materials. Spiropyran compounds were synthesized by one pot method. Indoline halides were reacted with various salicylaldehydes, and triethylamine was used as acid binding

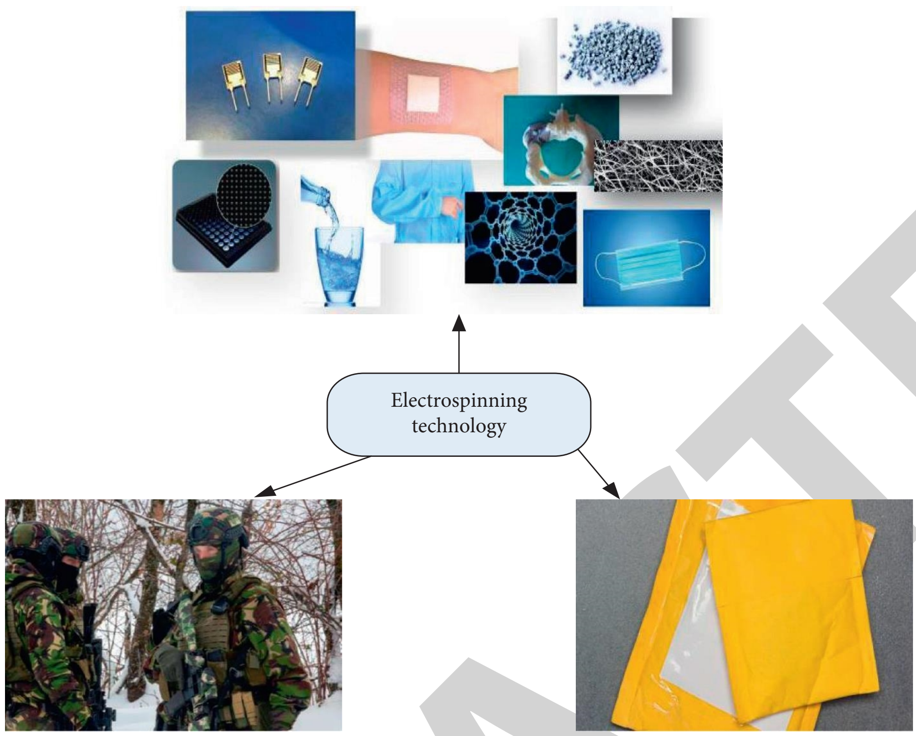

Figure 4: Application fields of electrospinning technology.

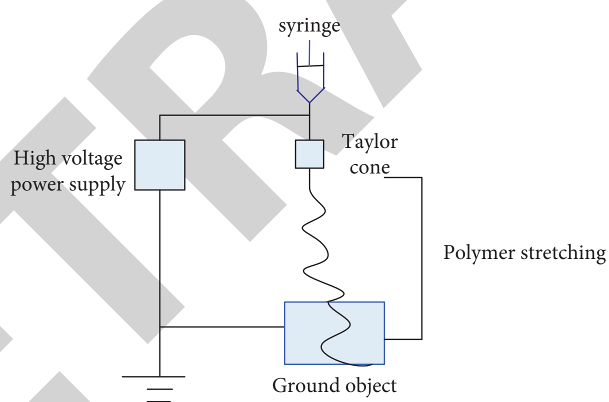

Figure 5: Flow chart of nanofibers produced by electrospinning technology.

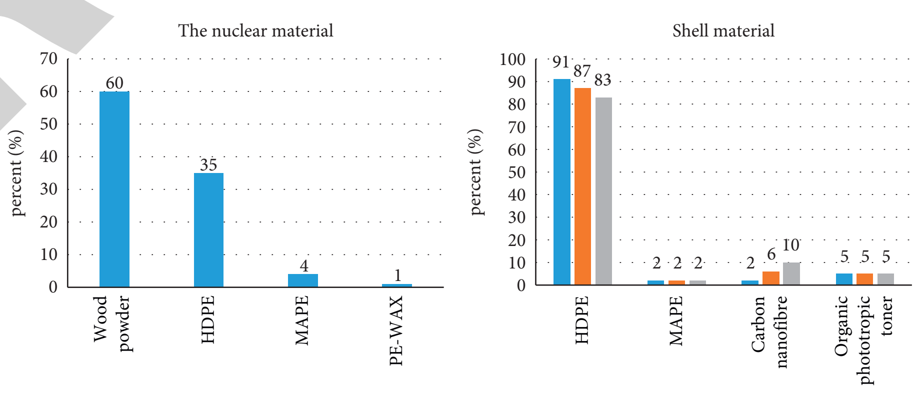

Figure 6: Composite material ratio diagram.

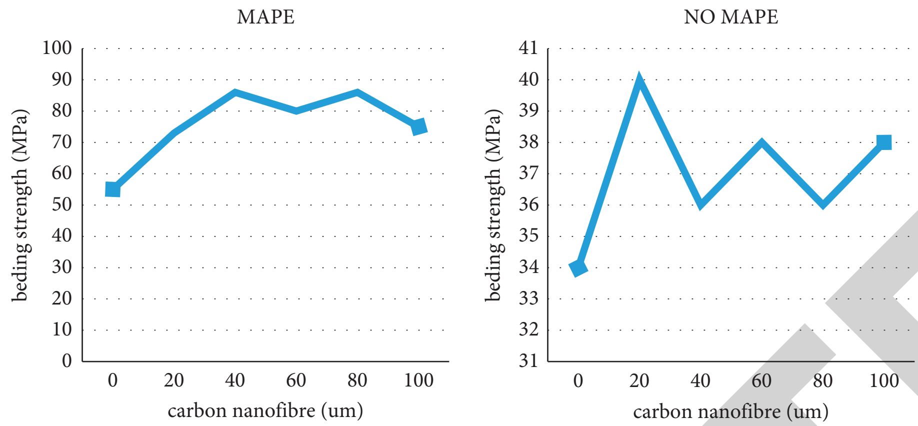

Figure 7: Comparison of bending properties of composites.

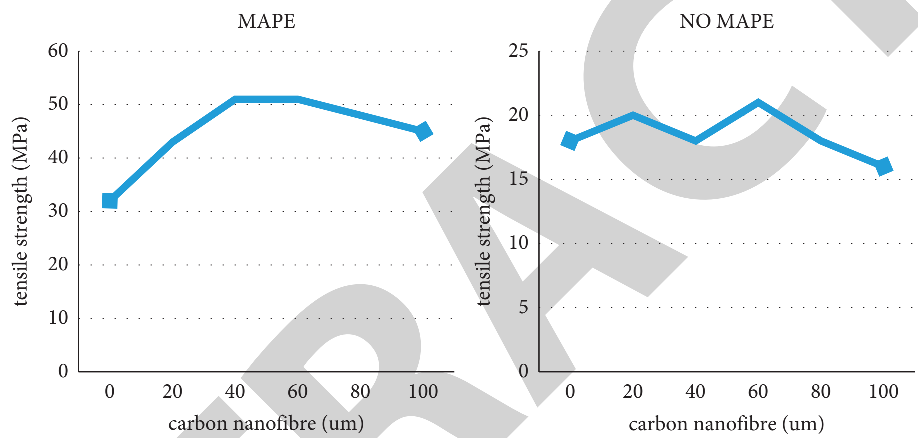

Figure 8: Comparison of tensile properties of composites.

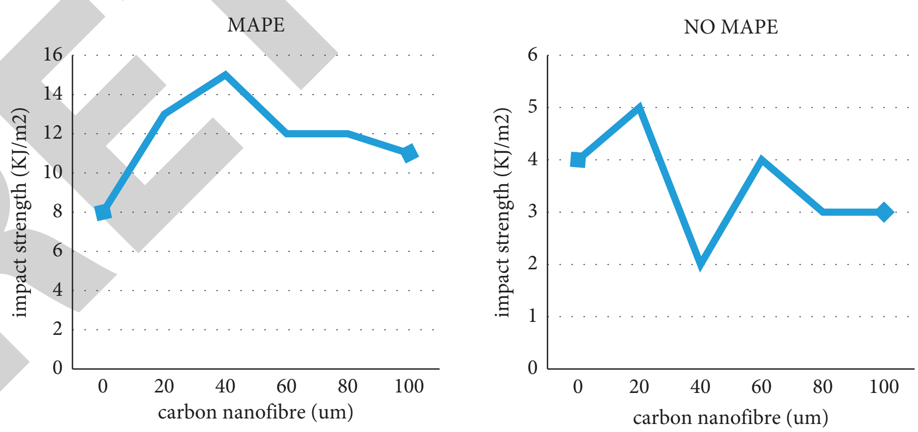

Figure 9: Comparison of impact strength properties of composites.

agent. Nano silica was added to the organic photochromic materials in group A and not in group B. the thermal stability and fatigue resistance of the two groups of polymer materials were tested.

It can be seen from Figure 10 that under the same temperature stimulation, the mass decomposition of the polymer added with nano silica is slightly slow, and the mass loss rate of the polymer is the fastest when the temperature is between 250 and 300 °C.

Figure 11 shows the process diagram of compound color change and color recovery. It can be seen from the data in the figure that the color changes of the two groups of materials

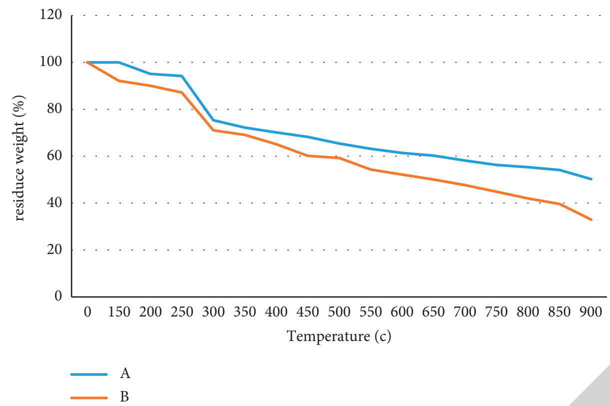

Figure 10: Comparison of thermal stability of polymers.

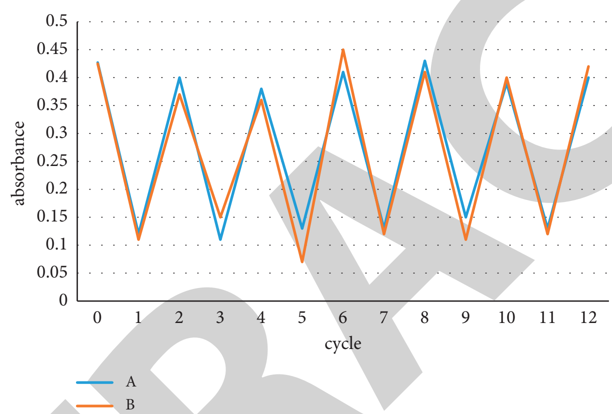

Figure 11: Comparison of fatigue resistance of polymers.

are reversible and can be recycled. It shows that both have strong fatigue resistance, and the value of group A is more stable than that of group B.

4.3. Experiment of Hakka Traditional Architectural Decoration Patterns by Adding Nano–Organic Photochromic New Materials. Taking the decoration pattern of doors and windows of Hakka traditional buildings as an example, the carbon nanofiber organic photochromic wood plastic composite was used in the decoration pattern material as experimental group D. New photochromic materials (wood plastic) without nano organic photochromic materials were used as experimental group E, and the two groups were compared. The flexural modulus, compressive modulus and thermal stability of the two kinds of materials are compared and analyzed.

Figure 12 shows the comparison of flexural modulus and compressive modulus of groups D and E. Flexural modulus and compressive modulus refer to the flexural and compressive properties of materials respectively. It can be seen from the data in the figure that the bending and compressive properties of the materials with nano organic photochromic composites are significantly stronger.

Figure 13 shows the comparison of thermal stability tests of two groups of materials. It can be seen from the figure that while the temperature of the two groups of materials increases, the material quality decreases. The experimental group with nano organic photochromic materials has stronger thermal stability. It shows that nano organic photochromic new materials have better neutral energy in use.

5. Discussion

This paper is committed to studying the practicability of using nano organic photochromic new materials in Hakka traditional decorative patterns. Hakka traditional culture, as a part of Chinese traditional culture, reflects the long history of Chinese traditional culture. Hakka traditional decorative pattern design originated from Hakka traditional culture. It is also a historical treasure and has certain research value. However, due to the limitations of time and region, there is no detailed investigation on the traditional decorative patterns of Hakka. Therefore, the understanding of Hakka decorative patterns in this paper is not deep enough. Organic photochromic materials are widely used, but in some fields, they are still in the research stage or can not be mass produced. In this paper, the properties of organic photochromic composites are studied experimentally, and the data are in line with the reality. However, due to the limitation of experimental equipment, there is a lack of some experimental data in the production of organic compounds. This is

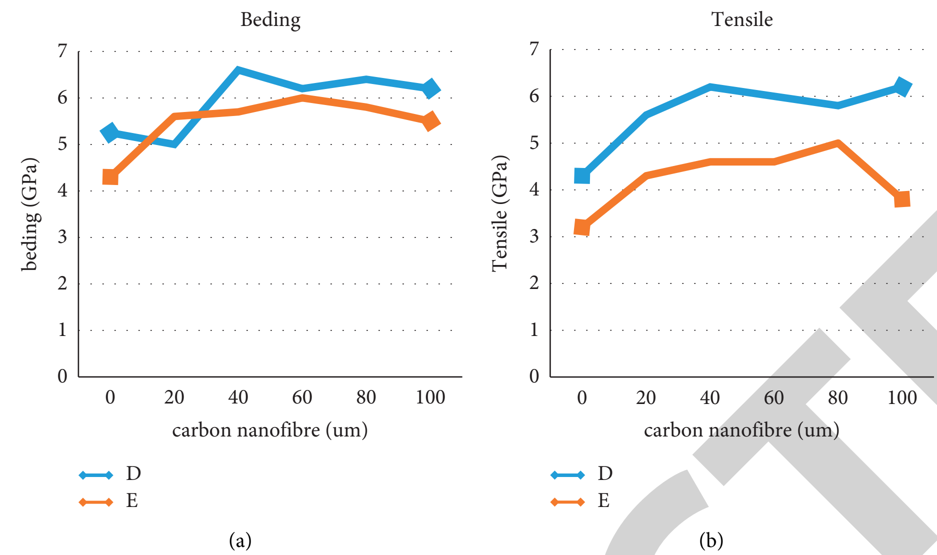

FIGURE 12: Comparison of flexural modulus (a) and compressive modulus (b).

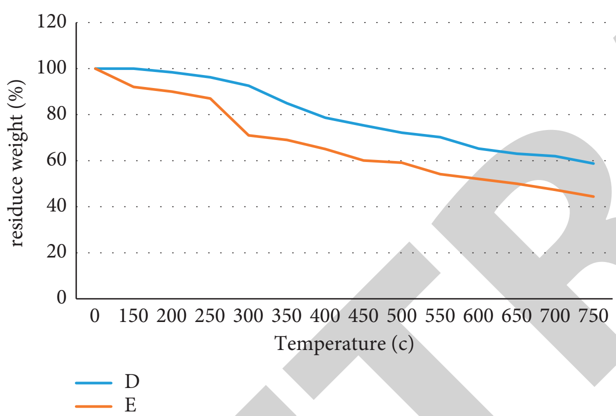

FIGURE 13: Comparison of thermal stability of polymers.

a major deficiency of this paper, and in the final experimental part, this paper only selects the architectural decoration pattern materials for comparative experiment, coupled with the limitation of the experimental environment, the experimental test indicators are not comprehensive enough. Therefore, the experimental part is slightly thin, which is where the follow-up work needs to be improved.

6. Conclusion

Through the analysis of relevant experimental data, it is concluded that the properties of carbon nanofiber photochromic wood plastic composites are stable. However, the addition of maleic anhydride grafted polyethylene in the composites is conducive to the enhancement of bending, compression and impact strength. In terms of bending resistance, the lowest bending resistance of the group with maleic anhydride grafted polyethylene is 15MPa higher than that of the group without maleic anhydride grafted polyethylene. In terms of compressive properties, there is a difference of 30MPa between the composites with maleic anhydride grafted polyethylene and those without maleic anhydride grafted polyethylene. Moreover, when the selected length of carbon nanofibers is 40um, the overall performance of the composite is the best, indicating that maleic anhydride grafted polyethylene is conducive to the combination of wood plastic materials and high-pressure polyethylene. By designing the experiment of doped nano silica organic composite photopolymer materials, this paper compares and analyzes the composites without nano silica. The experimental results show that the composites with nano silica have stronger thermal stability and fatigue resistance. Taking the design of Hakka traditional architectural decoration pattern with nano organic photochromic new materials as an experiment, this paper compares and analyzes the bending resistance, compressive modulus and thermal stability between traditional building materials and new materials. The experimental results show that the new photochromic materials with nano organic photochromic materials have better properties in all aspects, which also shows that the nano organic photochromic materials are more stable in physical properties.

6.1. Declaration of Conflicting Interests. The author(s) declared no potential conflicts of interest with respect to the research, author- ship, and/or publication of this article.

Data Availability

The data that support the findings of this study are available from the author upon reasonable request.

Conflicts of Interest

The author declared no potential confiicts of interest with respect to the research, authorship, and/or publication of this article.

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