

A Study on Diverse Designs of Furniture Presented as Graduation Projects by Graduates of Local Universities

- Focusing on painting methods for wooden surface -

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ABSTRACT

High glossy painting and UV lithographic painting as painting methods for wooden furniture have played a positive role in enhancing the diversity of furniture design, which has been proved by the analysis on the relationship between the change in the diversity of design and painting methods of graduation projects (wooden furniture) presented by graduates of local universities, as a focus of this article. Since the development of new painting methods has the potential to develop aesthetic characteristics of wooden furniture, many design experiments are needed to improve decorative features of furniture, such as the application of high glossy painting and UV lithographic painting.

Key words: High glossy, UV lithographic painting, wooden surface painting, furniture.

INTRODUCTION

Objectives

Wood materials are most widely used for furniture and physically and chemically sensitive to the contact with water and air. In other words, shrinkage, swelling, and deformation of shape are most serious weaknesses of wood as a material for furniture. Therefore, since there is a need for ways to enhance durability and water resistance of furniture, painting for the surface is widely used. Painting for wooden surface is of high importance in the curriculum for design majors who starts furniture design for the first time, and development and spread of new painting materials have been affecting positively on the enhanced diversity of furniture design. Therefore, this study analyzed graduation works presented by furniture design departments of local universities aiming at educating future furniture designers in Korea, focusing on surface painting. The study also looks into how the development of painting for wooden surface affects the production of furniture designs by students under the curriculum.

The cases of furniture design products that used oil-based lacquer paints for wood which have been most widely used lately, vegetable paints mainly used for craftwork and art furniture, environmentally friendly traditional Korean lacquer paint, ultraviolet paint of which use increases gradually in the curriculum of design majors, and UV lithographic printing technique in which painting and printing are possible at the same time were researched and investigated. These cases

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were examined, with the aim of measuring the change in the frequency of use of wood furniture painting techniques taught at schools and identifying advantages of individual painting techniques in design. The ultimate goal of the study lies in exploring how to link diverse materials with the development of painting methods for the progress of furniture design.

Method and scope of the study

To ensure that the study can be objective and generalized, two four-year universities (Department of Life and Art Craft Design, College of Arts and Sports of Sangi University and Department of Interior and Furniture Design, College of Design of Gangwon National University) which offer furniture design major courses at present were selected to conduct a thorough analysis on types, change in the frequency of use, and characteristics of painting techniques furniture designs among graduation works presented for the last three years.

In particular, the study focuses on changes in the curriculum for furniture making with the introduction of high glossy painting techniques and those in the aesthetic elements of furniture design due to the application of UV lithographic painting. First, furniture designs of graduation works submitted by graduates of the two universities were classified by the method of painting, and the number of designs and characteristics of patterns of each design group were described. Finally, advantages and design characteristics of high glossy painting and UV lithographic printing techniques were examined, and alternatives were proposed to explore new design applications for the future. In addition, as ‘environmentally friendly’ materials are gaining popularity gradually, the study suggests further research on how to apply traditional Korean lacquer paint to modern design.

THEORETICAL BACKGROUND

Types and Characteristics of Wooden Surface Painting Techniques

Painting for wooden surface not only improves durability and water resistance of furniture, but also plays a key role in highlighting aesthetic features of wood (grain and unique colors).

The purposes of this type of painting are i) to protect contamination, degradation, and damage of wooden materials, strengthening hardness, ii) to prevent moisture from permeating and block twists by humidity of the material. and iii) to add colors, patterns, gloss, solidity and tactile impression to the surface, making use of unique features of wood.²⁾

Among others, having an effect on colors, patterns, gloss, solidity and tactile impression of the surface can be a possibility of various painting techniques for aesthetic research and development of furniture design. For example, the fact that the same kind of wood looks different in colors depending on painting techniques explains why interior color plans for wooden furniture are needed, leading to the need of a design curriculum.

At present, three painting techniques such as oil-based lacquer paint, urethane lacquer paint for wood, high glossy paint or UV cure coating are most widely used in the curriculum of furniture design offered by four-year universities. with a small number of furniture design using natural vegetable oil painting and traditional Korean lacquer painting. Every painting method has its won colors and surface texture, and UV cure coating can even add painting images to the surface of wooded furniture with hi-tech equipment. In addition, painting with lacquer and vegetable oil

²⁾ Kang Shin-Woo. 2000. Modern Furniture Design. pp154-155. Mijin Publishing Company. Seoul. 311pp.

establishes the ‘environmentally friendly furniture design’ area and at the same time strengthens the possibility of market diversification, producing luxury furniture.

Table 1. Types and characteristics of wooden surface painting techniques

Types of Surface Painting	Material of Surface Painting	Method of Surface Painting	Characteristics		Reference
			Physical Characteristics	Visual Characteristics	
Oil-Based Lacquer ³⁾	Nitrocellulose + Plastic	Use of Suction-Feed Spray Gun	<ul style="list-style-type: none"> . Adhesion ↑ . Abrasion Resistance ↑ . Pliability ↑ 	<ul style="list-style-type: none"> . Shiny Surface 	
Polyurethane Lacquer ⁴⁾	Polyol + polyisocyanate	Use of Suction-Feed Spray Gun	<ul style="list-style-type: none"> . Use of Hardener Mixing . Fast Dryness . Two-Liquid Lacquer . Thick Paint-Work 	<ul style="list-style-type: none"> . High Transparency . Emphasize grain and unique colors 	
Ultraviolet Paint	Polyester Resin	Use of Suction-Feed Spray Gun	<ul style="list-style-type: none"> . Contain Monomer (React to Ultraviolet) . Fast Dryness . Keep up Percentage of Water Content Wood 	<ul style="list-style-type: none"> . High Effect of Color . Coated with Pearl or Metallic on Color Surface 	Apply to UV lithographic painting
Oil Finish ⁵⁾	Linseed Oil, Teak Oil, Danish Oil, Oil Varnish	Use of Cotton Rag	<ul style="list-style-type: none"> . One of the oldest Wooden Surface Painting Techniques . Durability ↓ . Dryness Time: 1 ~ 2 Day 	<ul style="list-style-type: none"> . Show Surface of Wood . Emphasize grain and unique colors 	Use of Mixing Oil-Based Varnish
Traditional Korean Lacquer	Natural Resin in Lacquer Tree	Use of Paste Brush	<ul style="list-style-type: none"> . Hardness/Adhesion/Glossy of Painting Surface ↑ . High Insulating . Slow Dryness 	<ul style="list-style-type: none"> . Tremendous Decoration Effect . Lacquerware Inlaid with Mother-of-Pearl 	

Specific explanations about characteristics and applicability of representative painting techniques for wooden surface as mentioned above are as in Table 1.

Survey on painting techniques for wooden surface used currently

Painting for wooden surface as the final process in furniture making is taught and experimented variously in the curriculum of the furniture design course of four-year universities. For the study on diverse furniture designs depending on painting techniques for wooden surface,

³⁾ 4 Besides Cho Suk-Kyung. 2002. Technology of Furniture. pp255. Publishing Department of Seoul National University. Seoul. 481pp.

⁴⁾ Jung Bok-Sang/Kim Sang Kwon. 2001. Furniture Design. pp204-205. Mijin Publishing Company. Seoul. 245pp.

⁵⁾ Mick Allen. 2007. The Complete Guide to Wood Finishes. pp76-77. Korea Wood Newspaper Company. Seoul. 160pp.

two four-year universities were selected to analyze wood furniture designs as graduation works for the last three years.

The reason for choosing two from universities located in Gangwon-do, not from a nation-wide level is to ensure regional characteristics and efficiency of the study. Criteria for analysis and data extraction are defined largely into three; firstly, the frequency of uses of painting techniques for wooden surface by year is measured to predict changes in the preference of painting techniques for wooden among students; secondly, visual characteristics and common design features of individual painting techniques are generated; and thirdly, the direction of aesthetic changes of furniture design with the application of new painting techniques is examined. Oil-based lacquer paints were found to be mainly used for furniture painting, and overall situations of the use are as in Table 2.

Table 2. Survey on painting techniques for wooden surface used currently

Year	Total Work Number		Work Number by Oil-Based Lacquer		Work Number by Polyurethane Lacquer		Work Number by Ultraviolet Paint		Work Number by Traditional Korean Lacquer		Work Number by Other Lacquer	
	Kangwon Univ	Sangji Univ	Kangwon Univ	Sangji Univ	Kangwon Univ	Sangji Univ	Kangwon Univ	Sangji Univ	Kangwon Univ	Sangji Univ	Kangwon Univ	Sangji Univ
2005	54(100%)	29(100%)	44(81.4%)	29(100%)	9(16.6%)	0	0	0	0	0	1(1.8%)	0
2006	30(100%)	19(100%)	20(66.6%)	13(68.4%)	1(3.3%)	1(5.2%)	9(30%)	2(10.5%)	0	2(10.5%)	0	1(5.2%)
2007	32(100%)	23(100%)	19(59.3%)	11(47.8%)	8(25%)	2(8.6%)	3(9.3%)	8(34.7%)	0	1(4.3%)	2(6.2%)	1(4.3%)

Each painting technique is sufficiently taught in the curriculum, and students can choose a technique they want depending on their design intention. Oil-based lacquer painting for wood is most widely used, because of its relatively simple process and easy accessibility of painting materials. This technique is mainly used for the color-based art craft decoration design on the surface of furniture, and UV cure coating for vanishing the surface of furniture and expressing various images with hi-tech equipment.

Korean lacquer painting and acrylic paint painting were found to be used by a small number of students, and the former was more frequently used at Sangji University (located in Wonju City), given the characteristics of the region.

OPTIMUM STUDY

Results of the analysis and characteristics

With regard to the use of wooden furniture surface painting, it was noteworthy in the curriculum of the two universities that schools are late to introduce a new method to their curriculum, compared to the local furniture industry in Korea today. This situation should be tackled urgently to boost the development of local furniture design. Currently, a significant number of products on the furniture market are manufactured by UV cure coating, but sufficient studies on designs using the technique have not been made at the level of universities, which is expected to affect the progress of the local furniture industry negatively for sure.

In relation to the change in the preference of wooden surface paintings, the analysis of graduation works of the two universities for the past three years has shown that the use of urethane lacquers for wood and UV cure coatings increased, while the use of oil-based lacquers for wood

decreased. This is probably because a growing number of students began to see aesthetic features of furniture as important in design. This study showed that such a trend was noticeable from graduation works of furniture design majors at Department of Life and Craft Design of Sangji University.

In 2005, oil-based lacquers for wood was used by all of the 29 wood furniture design graduation works (100%). However, in 2006 the ratio of oil-based lacquers for wood decreased (68%), while new painting techniques such as urethane paint lacquer painting (5%), UV cure painting (11%), traditional Korean lacquer painting (11%), and acrylic paint painting (5%) began to be used. In the case of graduation works in 2007, both universities showed gradual decrease in the use of oil-based lacquers for wood, compared to the previous year.

At Department of Interior and Furniture Design of Gangwon University, around 41% of wood furniture designs used other painting techniques than oil-based lacquers for wood, while more than half of the graduation works of furniture design majors Department of Life and Craft Design of Sangji University (52% or so) were made with other methods. The oil-based lacquers for wood, which had been widely used until 2005, are characterized by a design process in which wood grain is used as an aesthetic element of furniture.

Therefore, designs to apply natural beauty by carving or symmetric beauty of wood grain to furniture in most cases. However, it can be said that urethane paint lacquer painting and acrylic painting meet the design intention to find craft elements key to furniture making from colors. Common design features of furniture painted with urethane paint, lacquer paint, and acrylic paints among the graduation works are the fact that they put priority on colors in a simple pattern. Most designs emphasize color attributes such as primary colors with high saturation and luminance or strong color contrast of white-black. In addition, compared to the manufacturing process of furniture with unprocessed timber or patterned wood, easier process results in the reduction of working hours. The easier manufacturing process in which cut plywood boards or MDFs is made into a structure with screws or wood biscuits and then painting is conducted with a spray gun appears to be positive in terms of economic aspects of design.

UV cure coatings can be most widely used in terms of diversity of design. As shown in the graduation works of the two universities, furniture designs made by UV cure coating expressed best individuality of students, as other students who visited the exhibition graduation works agreed. Specifically speaking, among the students in their third year who visited the Gangwon University graduation work exhibition held in October 2007, all the respondents chose furniture designs using UV cure coating as 'most favorable designs.' Therefore, it is necessary to develop various furniture design techniques based on UV cure coatings in the curriculum for the education of future furniture designers to help produce more sensible and unique furniture designers.

Application of painting techniques and suggestions for design diversification

As mentioned in the subtitle of this paper, the primary goal of this study lies in exploring the direction of the development of furniture design using high glossy painting and UV lithographic painting techniques and ultimately proposing various method of manufacturing. Lately, consumers have perceived high glossy painting as a trend of meeting aesthetic needs of furniture. High glossy painting, referring to UV cure coating, is characterized by the fact that unique colors are not faded by paint, powdered varnish functions properly and independently, and the surface is sufficiently protected from shock.

However, most ready-made furniture today uses high glossy painting in which colors of the surface of furniture are variously processed. Fig. 1 shows a high glossy paint-based kitchen furniture product made and sold by HANSSEM, called NEOEURO 6000 Pearl Wine and NEOEURO 6000 Pearl Glass.

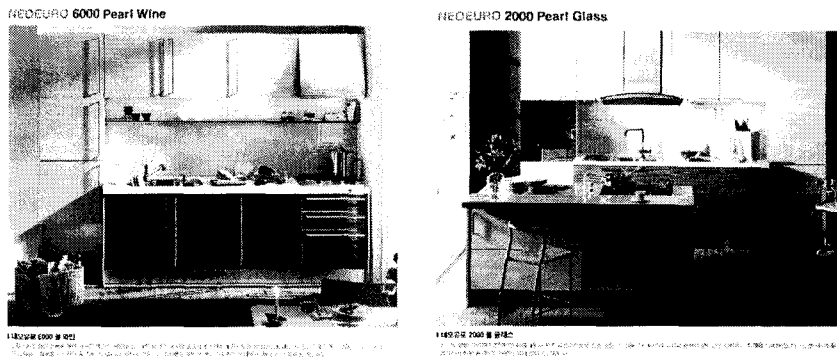


Fig.1. High glossy paint-based kitchen furniture product made and sold by HANSSEM.

As seen in the picture above, designs using simple differences in colors have a limitation on diversity. One UV lithographic painting-based design out of graduation works presented by interior and furniture design majors of Gangwon University in 2007 and four designs using the same method from Sangji University can be seen as a new alternative to overcome the design limitation of existing high glossy painting-based furniture.

Fig. 2 shows four of the five designs as mentioned above, which maximize decorative effects of furniture by printing colorful and detailed images on the surface in an innovative way. For the images on the surface, a design process should come first to work on desired colors, patterns, and photos on a computer using Adobe Illustrator, which is widely used by student majoring in design areas.

In addition, selected background colors are painted on the front and completely dried. Completed images are printed on the dried surface with a UV lithographic painting machine before coating as a final process. UV lithographic painting has opened a possibility to develop designs for furniture decorated with various image with hi-tech painting equipment.

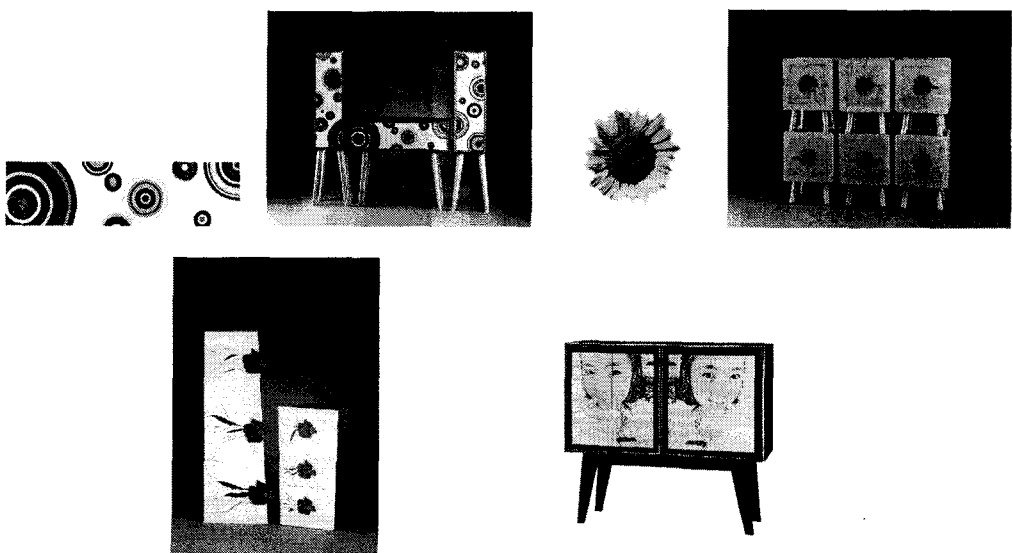


Fig.2. UV lithographic painting-based design out of graduation works in 2007.

In particular, among graduation works of Sangji University, decoration furniture design in which a photo of the designer is printed on the front (upper right in Fig. 2) is a fresh idea for the development of customized art furniture design. As discussed earlier, the development of new painting method for wooden surface can be seen as an inspiring phenomenon enabling the swelling of wood furniture design and introduction of new expression methods. It is expected that high glossy painting and UV lithographic painting alone will allow for more advanced furniture design.

Issues for further studies

Studies on beautiful furniture expressions using high glossy painting and UV lithographic painting have been assessed positively currently, and gradual progress and in-depth studies will be made in the curriculum of schools. It is important to note that sufficient efforts have not been made to raise economic efficiency of painting materials and methods, since students were in charge of design development in previous studies. As the economic aspect of three elements of design is highly important for product manufacturing, estimated budget and ways of cost reduction should be studied at the same time for the application of a new painting technique to the furniture design in the future.

In addition, graduation works of Sangji University in 2006 suggest the need of a study on design with regard to traditional Korean lacquer painting, accounting for around 11%. It seems that a study on modern application of traditional Korean lacquer painting to antiques and cabinets inlaid with mother of pearl will be a good opportunity to help consumers understand environmentally friendliness of furniture design, beyond the conventional wisdom on lacquer painting.⁶⁾ There are many more issues open for studies, including surface texture by lacquer painting method and strategies to raise economic efficiency by the use of alternatives to lacquer such as cashew.

In particular, Sangji University is located in Wonju, which is well known for its lacquer produce, and therefore the successful application of lacquer painting to modern furniture design will have a significantly positive effect on the industry-academy-government cooperation system in link with a representative local industry as well.

CONCLUSIONS

Painting for wood furniture plays an important role in improving durability and water resistance and highlighting aesthetic features (grain and unique colors) of wood. Recently, the progress in painting techniques for wooden surface has expanded the realm of furniture design, meeting consumers' aesthetic demands for furniture. As more people tend to place higher value on aesthetic aspects of furniture than functions when selecting furniture, more studies are needed on design diversification by painting for wood furniture.

As representative new painting methods to meet such needs, high glossy painting and UV lithographic painting are actively being experimented in the curriculum of design majors at

⁶⁾ Son Dae-Hyun. 2006. Craft of Traditional Korean Lacquer Painting. pp8. Korea Cultural Heritage Foundation. Seoul. 127pp.

four-year universities. From the graduation works of the two universities selected for this study, we can see that introduction of new painting methods has increased gradually over the past three years, as shown well in the development of surface decorating technique for wooden furniture by the application of high glossy painting and UV lithographic painting.

This means that high glossy painting has an unlimited potential to overcome limitations of ready-made furniture items on the market today and furthermore as a means of expressing design sensitivity of students. The analysis of graduation works of the two universities indicated that UV lithographic painting, in particular, hints at a possibility to develop a design for furniture decorated with various images using hi-tech painting equipment and has a greatly positive element in improving capabilities of prospect designers, who will lead the progress of the local modern furniture industry.

How to maximize economic advantages of new painting methods and modernization of environmentally friendly painting are waiting for further experiments and trials in the future. In addition, the link of high glossy painting and UV lithographic painting has been studied as a means of printing various images on the surface of furniture. Therefore, the study is expected to propose a positive direction for the development of mass and customized furniture production system.

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