

# Novel Bleaching and Dyeing Technology of Mink Skins

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**Abstract:** For fur products, fashion color design has great significance in increasing additive values and improving the economic efficiency of the enterprises. The mink skin is known as the King of the fur. According to the mink skins' characteristics and market requirements, eight fashion-colors were designed as follows: 1) bleaching the skins in yellow color. It means that the whole fleece should be retreated into gold; 2) keeping the color of guard hair when bleaching undersurface fluff; 3) bleaching the undersurface fluff, at the same time making guard hair into yellow; 4) only bleaching the tip of hair, and retaining the original hair color; 5) dark blank color; 6) bright color; 7) snow top effect; 8) two-tone effects. Their processes were also studied systematically in the article. Mink skins have the characteristics of compact structure on the scale of guard hair, loosely structure of the fluff, deep color on top of guard hair, light color on undersurface fluff. The guard hair is difficult to fade and be dyed, but easy for undersurface fluff. According to these characteristics, the production technology of mink skins in different kinds was realized through some experiments.

**Key words:** Mink Skins; Bleaching; Dyeing; Fashion Color; two-tone Effect

## 1 Introduction

Mink skin is known as the king of the fur. The dyeing and finishing processes of the mink skin play an important part in almost all the methods of fur dyeing and finishing and could be good references to other types of fur to a certain extent. For fur products, fashion color design get from different methods of color bleaching and dyeing, has great significance in meeting the tide of fashion and the need of personality, and also increasing additive values. According to the mink skins' characteristics and market requirements, eight fashion-colors were designed, such as bleaching the skins in yellow color, keeping the color of guard hair when bleaching undersurface fluff, bleaching the undersurface fluff, only bleaching the tip of hair, dark blank color, bright color, snow top effect, double color effects and so on. Their processes were studied systematically in the article.

## 2 Experimental

### 2.1 Experimental material

Mink skin was supplied by Yatai Fur Co., Ltd, Buffer agent BL-15, Buffer agent M-30, Protective Agent MB, Bleach JHL, Rodol N<sub>2</sub> (Oxidative dye), Rodol D (Oxidative dye), Rodol Black LB (Oxidative dye), Acid green M, Acid yellow T, Acid blue T, Bleach LCN-3 was supplied by Jos.H.Lowenstein.Sons, INC.

### 2.2 Experimental process

#### 2.2.1 Bleaching the skins in yellow color

Tetreated the fleece into gold, which contain different levels of bleach, the color effect of the fleece

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can be divided into whole gold, the transition gold colors and two sides gold color.

The details are as follows: "open" pretreating process was used firstly, then the mink skins were bleached using hydrogen peroxide under the condition of high temperature and high pH, for sure that the guard hair and fluff are made into uniform yellow appearance. The process include:

- (1) "Open" pretreating process. Temperature 35 °C , NaCl 60g/L, Wetting agent 2ml/L, Na<sub>2</sub>CO<sub>3</sub> 5g/L, washing after 1 hour.
- (2) aldehyde Retanning. Temperature 32 °C, NaCl 50g/L, Formaldehyde 10ml/L, pH of 7±, deal with about 12h at above conditions.
- (3) Washed
- (4) Bleaching the skins in yellow color. Temperature 35-37 °C , NaCl 60g/L, Wetting agent 1ml/L, Buffer BL-15 20g/L, Protective agent MB 4ml/L, after the skins was treated for 30min. Adding Hydrogen peroxide 80ml / L into the bath by four times, each time interval 60min and then continue bleach 2-4hour.
- (5) Washing with salt at room temperature, using NaCl 30g/L for 30min.
- (6) Retanning. If being produced directly, retanning only need with the aluminum tanning agent and if need another dyeing process, retanning should be deal with chrome tanning agent..

### ***2.2.2 Keeping the color of guard hair when bleaching undersurface fluff***

The possibility of mordant method using FeSO<sub>4</sub> was explored. According to the differences in absorbing FeSO<sub>4</sub> between guard hair and fluff, hydrogen peroxide under the conditions of low temperature (30 °C) and pH value (7 ±) were used, and in the same time keeping the color of guard hair for a short period of time when bleaching undersurface fluff. The process includes:

- (1) aldehyde retanning.
- (2) mordant Pretreatment Temperature of 32 °C , NaCl 50g/L, Acetic acid 2ml/L, FeSO<sub>4</sub> 10g/L, more than 8 hours.
- (3) bleaching. Temperature 32-35 °C , NaCl 60g/L, Wetting agent 1ml/L, Buffer M-30 20g/L, Protective agent MB 4ml/L, for 30min. Hydrogen peroxide 20ml/L, 60min. Hydrogen peroxide 20ml/L, for 120min.
- (4) salt washing.
- (5) remove the iron. Temperature 32 °C, NaCl 50g/L, Oxalic acid 2g/L, for 120min.
- (6) salt washing and retanning

### ***2.2.3 Bleaching the undersurface fluff, making guard hair into yellow***

Washing the guard hair by alkali solution and then retanning it before mordant dyeing with FeSO<sub>4</sub>. By improving the temperature and extending the time of hydrogen peroxide bleaching, white effects could be reached for both the guard hair and fluff. The process includes:

- (1) opening, aldehyde retanning and mordant Pretreatment
- (2) bleaching. Temperature 35-37 °C , NaCl 60g/L, Wetting agent 1ml/L, Buffer BL15 20g/L, Protective agent MB 4ml/L, for 30min. Hydrogen peroxide 20ml / L, for 60min, Hydrogen peroxide 20ml/L, 4hours.
- (3) salt washing
- (4) remove the iron: temperature 32 °C, NaCl 50g / L, oxalic acid 2g / L, 120min.
- (5) salt washing and retanning

### ***2.2.4 Bleaching the tip of hair only, retaining the original hair color***

Using high-concentration of hydrogen peroxide to deal with the hair tip by brush-bleaching or printing-bleaching at a short time, bleach the tip of hair only but retaining the fluff original color. The process includes:

- (1) opening, aldehyde retanning and mordant pretreatment
- (2) sawdust-rotating. Putting sawdust in the drum, then dry hair by rotating.

(3) Composition of bleaching. NaCl 60g, Wetting agent 1ml, Buffer 40g, Protective agent 6ml, Hydrogen peroxide 200ml, Bleach JHL 200g, Water 600ml, Thickening Agent 5g.

(4) brush bleaching. To brush the tip as soon as possible, holding temperature as 40 °C, for 30-60min. Then wash away the surface Slurry.

(5) salt washing, then removing the iron, and salt washing again, retanning at last.

### **2.2.5 Dark blank color**

Do some researches on dyeing deeper black color by using oxidative dyes under low-temperature, which is good for the skin to keep excellent extension and flexibility, as skins maintain better shrinkage at low temperature. The process includes:

(1) skin washing, temperature of 32 °C, NaCl 40 g/L, Na<sub>2</sub>CO<sub>3</sub> 2g/L, degreasing agent 2g /L, for 2 hour.

(2) mordant Pretreatment, temperature of 32 °C, NaCl 40g /L, bichromate 2.5g/L, potassium hydrogen tartrate 2g /L, formic acid 1ml /L, pH3-4, past on day, take out the skin and centrifuge.

(3) dyeing, temperature of 35 °C, NaCl 40g/L, oxidation dyes Rodol NZ 2.4g /L, oxidation dyes Rodol D 1.8g /L, oxidation dyes Rodol Black LB 1.8g/L, hydrogen peroxide 1ml/L, cast skin quickly, paddling 30min. Adding Bleach Assist MB 2.5ml /L, 1hour, hydrogen peroxide 1ml /L, 60min, hydrogen peroxide 1ml /L, keep more than 8hour, then take the skin out of bath and centrifuge.

(4) washing skin, retanning, drying, drumming, brush with oil, stretched, stretched wide, dry cleaning, drum to brightener, drumming again.

### **2.2.6 Bright color**

The dyeing process with acid dyes was searched at a temperature of 58-63 °C), pH lower than 3.5 with strong mechanical affects for mink skins, and complete chromatography and bright colors were obtained, while maintaining the soft and extensive skins.

For example, dyeing the color of khaki for Chinese Mink Fur:

(1) bleaching the skins to the color of yellow.

(2) chrome tanning, temperature 32 °C, NaCl 40g /L, formic acid 2ml/L, for 2 hour, chrome tanning agent 10g/L, 2h, sodium bicarbonate Xg /L, pH3.6, over night, washing and centrifuge.

(3) dyeing, temperature 60 °C, Sodium Sulfate 5g /L, leveling agent 0.5ml/L, 5min, Acid Green M 3.7 g /L, Acid Yellow T 1.2g/L, acid blue T 0.7g/L, for 2hour, formic acid 0.5ml/L, 30min, take the skin out, washing, drying and finishing.

### **2.2.7 Snow top effect**

With the snow top dyeing, we discharge the color under the help of reducing agent in the steaming, and get white on top of hair by the snow top effect. The process includes:

(1) to wash skin, then chrome tanning

(2) dyeing: temperature 60 °C, Sodium Sulfate 5g/L, Leveling Agent 0.5ml/L, 5min, Lowacene Charcoal gray 7g/L, 2hour, formic acid 0.5ml/L, 1h, take the skin out, washing and dry.

(3) stripping: fixed on the broad to discharge color. the stripping liquid: 150g Bleach LCN-3, 550ml water, 300ml of formic acid. spraying it out on the tip of skin, steaming at 70 °C, 5min then drum to dry.

### **2.2.8 Two-tone effects**

The double colors was get from the affect of brush-dyeing on the hair tip of the snow top dyed skins.

For example, get two-tone effect of blue top and black boot for white mink

(1) first, use the method of 2.2.7 to made the white mink dyed into snow top effect of gray root.

(2) preparation the dyeing liquid: 20g Brushing Blue R, 850ml water, 50ml Solvent C-10, 50ml Brushing Assists B, 5g thickener 44, 50 ml Formic acid.

(3) spraying it out on the tip of the hair, steaming, at 70 °C, 20 min then drum to dry.

### **3 Results and discussion**

#### **3.1 Color Bleaching**

Color bleaching of hydrogen peroxide is used to oxidize the pigment of hair into the color we need. Hydrogen peroxide is a strong oxidant, it can damage skin and hair strength, so aldehyde retanning must be carried out before bleaching. Buffer and protective agents are added to bleaching bath for protecting skin and hair structure.

##### **3.1.1 Bleaching the skins in yellow color**

The fleece should be retreated into gold by using hydrogen peroxide oxidation on pigment of hair. The guard hair of mink skin is much harder than fluff, so it is easy to get different color between the guard hair and the fluff. In order to achieve uniform color, the guard hair should be dealt with an additional way commonly known as "opening the hair" to damage its strength into a proper level before bleaching. Through the opening process, hydrogen peroxide can bleach the internal pigment more quickly and effectively. In the help of higher pH ( $8 \pm$ ) and higher temperature ( $36^\circ\text{C} \pm$ ), the color of the guard hair and the fluff can be oxidized the same.

##### **3.1.2 Keeping the color of guard hair when bleaching undersurface fluff**

The key point is as follows: Firstly, it is necessary to protect the guard hair from damage in bleaching, so alkaline substance can not be used to deal with guard hair. Using  $\text{FeSO}_4$  as mordant pretreat the skins, the fluff can absorb  $\text{FeSO}_4$  more than guard hair, because of the absorption difference between guard hair and fluff, which can control the oxidation effect on the guard hair as little as possible in bleaching. Secondly, in order to protect the guard hair from the hydrogen peroxide, a lower temperature ( $30^\circ\text{C}$ ), lower pH values ( $7 \pm$ ) and short time are kept.

##### **3.1.3 Bleaching the undersurface fluff, making guard hair into yellow**

The key in this process is to bleach the guard hair and fluff together. Firstly, washing the guard hair by alkali solution. Then using mordant dyeing with  $\text{FeSO}_4$  to ensure the fluff being bleached into enough white. By improving the temperature and extending the time of hydrogen peroxide bleach, fluff could be bleached into yellow.

##### **3.1.4 Bleaching the tip of hair only and retaining the original hair color**

This approach applies to brush-bleaching or printing-bleaching, and makes the fluff retaining the original hair color after bleach. The basic principle is the same as water bleaching, only high-dose hydrogen peroxide was added in bleaching process, hair tip will be bleached in a short period of time. Pay attention to the bleaching process, don't let the bleaching liquid touch skin. Once stick to the skin, it will be oxidized to damage and a few thickener can enable bleaching liquid remained on the tip.

#### **3.2 Dyeing**

##### **3.2.1 Dyeing black with oxidation dyes**

Black is the hardest color to dye, when dye mink skin black with acid dyes, the large amount of dyes must be used, and the need for temperature is high, both the skin and hair have huge damage phenomenon, which is easy to make skin being hard and thick. If dyeing with oxidation dyes, high-temperature is no need, that led to a little damage on skins. Therefore, this dyeing method is very practical for the mink skin's requirements of a very good skin extensibility and flexibility.

Dyeing black by using oxidation dye can be divided into two steps, one is mordant treatment and the other is dyeing. Using dichromate as mordant not only can make the guard hair and fluff the same color, but also can increase the strength of skin. The condition of using dichromate mordant only need room temperature ( $30^\circ\text{C}$ ). When adding a number of chelating agents to promote the dichromate combining with

hair fiber, potassium hydrogen tartrate is the best chelating agent to use, pH value must be controlled between 3-4. In order to protect hair not being hurt in dyeing process, protective agent is needed, it can protect the skin. While in order to avoid too much damage on fleece from hydrogen peroxide, which results in the phenomenon of hair back and hair separation, a few amount of hydrogen peroxide is used and acts in concert with extending dyeing time, in which case the dyeing process carries out more slowly and moderately, which will do the greatest degree to protect the hair and skin. The pH value of the control dyeing in neutral was ranged (7-8), in which case the process of oxidation is slowly, so that the color of hair and skin will uniformly appear and accompanied by enhance the uptake of dyes.

### **3.2.2 Dyeing with acid dye**

If the needed color is more deeper than its natural color, acid dyes can directly be used after chrome retanning, this law only applies to light fur color. But when the needed color is more lighter than its natural color, it should be bleached first for mink fur. When dyeing with acid dyes, the most important thing is to protect the hair and skin, dyeing can't have the phenomenon of hair shrinkage and skin hardness. As different parts of mink have quite different hair properties, such as guard hair and fluff, which will lead to appear colored spot problem, thus very good level dyeing methods must be carried out. The main dyeing key points as follows.

The important is the temperature. Temperature control in 58-63 °C, which can make dyes easy to dye and not too fast, it's good for dyeing uniformly and also not to damage skin as a result of high temperature;

pH value is second key. The lower of pH value, the more favorable for dyes to tack up. But dyeing too fast, the uniform effect of dyeing will be reduced. At the same time, with lower pH value, the skin will fade the effect of tanning by acid affection and reduce skin's softness and extension, so the pH value of dyeing should not be less than 3.5, less acid is good for the skin.

Mechanical action is the third one. Mink will not easily to produce felting shrinkage, so strong mechanical action is good for dyeing. One can improve level dyeing greatly and the other can raise the rate of dyeing at the same time of level dyeing. It not only save time, but also save leveling agent and dye. The best way is using drum dyeing replace paddle vat

### **3.2.3 Snow top effect dyeing**

Snow top effect dyeing is also belong to the scope of acidic dyeing, the conditions of its method is the same as acid dye dyeing, an additional striping process in Snow top effect dyeing was expected. It is a way to use reducing agent on the tip of hair, changing the structure of the dyes then removing color. At the same time, reducing agent will have bleaching effect on tip, which led to hair color more white than before dyeing. It is very important to keep the skin completely dry in striping, or skin will be burnt or hard in process of high temperature. Striping liquid should be brushed evenly to ensure not penetrate to the hair root and the skin. The temperature controlled not too high (nearly 70 °C), not to produce condensed water while color drawing. color time should not be too long, 5-8 minutes is good enough, or it is easy to have a plastic phenomenon, and also affect the skin's whiteness.

### **3.2.4 Jet dyeing of hair tip**

To get the two-tone effect from jet dyeing process in mink fur dyeing and finishing, the basic principles of jet dyeing is to use high concentrations of dye solution, add special agents and the dye fixing agent, in which case the dyes can be fixed on the hair fiber in a short period of time. The jet dyeing of mink with guard hair usually using oxidation dyes; for mink of barely guard hair is usually dyed with acid dyes. Oxidation dyes are used in dyeing into black commonly, acid dyes used to dyeing other colors.

The key of jet dyeing is that the dyes should be fixed on the tip evenly, it means not only to spray the dyes liquor evenly on the tip, but also ensure the dyes uptake hair uniformly. As the tip of various parts of

the skin have different thickness and hardness, and the density of the hair on various parts is also not the same, if we want get the uniform color on appearances, one way must be think out to allow the dyes jetted on the tip is absorbed as much as possible, in which the role of additives is important. By the way, in order to ensure the spray dyes on the hair can penetrate into hair inside and combine with hair fiber immediately, strong diffusivity and fixing agent is needed.

#### **4 Conclusion**

Fur dyeing and finishing technologies, especially the popular color production technology, is a collection of science, technology and art together. Mink skin is known as the king of the fur, it's hair was characterized by a huge pile, smooth guard hair, light and flexible. It is the best quality of fur. Mink's dyeing and finishing will have the effect of icing on the cake, otherwise will self-defeating. This requires staff not only master the fur dyeing and finishing technology, but also understand a certain amount of color theory and color combination knowledge.

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