

Change in Colors by Light in Fashion

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I. Preface

Thanks to the development of science, new and diverse materials have been developed and used in the fashion industry. There came even some materials that interact with light to indirectly control the appearance of a cloth or light sources are attached to a cloth to actively express diverse changes of colors using light. Some clothes are even produced considering the light in the place where it is going to be worn. The effect of light touching the surface of a cloth can be adjusted by first taking into consideration the degree of light spread (level of defused reflection), location of the light source, hue and light intensity, and choice is made out of various cloth styles, forms, textures, and colors so that desired effects can be created. With the glossy materials that generate bright and dark areas, impact of light that may vary depending on the intensity of the light source, its angle, volume and direction should be taken into consideration.

Changes in the color triggered by light especially in fashion are created by a combination of two or three reactions of light: absorption, reflection and transmission. And effect on the changes in colors can be classified into two categories: one coming from the external light source, the other from internal one.

People can detect colors via the light directly coming from a light source or another one reflected from a surface. Designers need to adjust the color changes caused by such different types of light. It would be hard for fashion designers to control the light itself but they can manipulate its effect by adjusting the surface on which light falls.

It is important to notice the changes in colors by light source and this paper had a close look at the magazines and data on fashion design. Based on the understanding of the concept of light and colors, the light in the contemporary world grabbed by artificial illumination is reinterpreted in this paper. Research was focused on the colors generated by artificial lighting when it comes to the changes in the color caused by light. The changes in the colors of textures under artificial light are studies as well.

II. Research on the Theory on the Light and Color

1. Concept of Light and Color

Concept of light was first formed from the changes in the visual stimulants created in contrast with darkness. Almost everything is represented in the color as long as there is

light. Visual sensation and perception allow humans to feel the color. Colors are the outcome of light and light is where the colors have sprung from. Light not only provides illumination and colors but also clearly shows lines, forms, and surfaces. It even determines their locations.

A shadow is created by the amount and angle of the light source and it is affected by the amount of light reflected on the surface of an object. In other words, the level of brightness recognized by people differs depending on the volume of luminosity of the light source and amount of light reflected from the surface of an object. The surface of an object looks different depending on the direction of light.

There are a variety of lights including artificial ones such as laser, fluorescent light, neon, candle, match light, etc. When the light from a certain light source shines on the exterior or interior of a surface of an object, our eyes can see the *different aspects of brightness and colors*. All types of reactions including refraction, nature of the particles reflected and its interference, and diffraction are combined to influence the perception of color and luminosity creating aesthetic effect.

The colors created by the light shining on the surface of an object can be summarized as two types. There are different colors generated depending on the wavelength of light and changes in the contrast are determined by the volume and angle of light. This represents the situation where lights shine on another object as an external light source. As said, light can exist exterior to an object or stay inside an object, which is represented by radiation.

2. Effect by Light Source

One of the things that determines the changes in the color created when light reaches the surface of an object or stays inside an object is the feature of the light source. The type of light source shining on an object, amount of light coming from a light source, and the angle of light source create changes in the color. So the same color can look different depending on the type and feature of the light source.

Light coming from a wide-reaching source like the sun or light coming from a number of light sources like the fluorescent light can reach wider area of surface at a wider angle reducing the contrast between the dark and bright areas creating more even and soft *silhouette and making the surface of a material look smoother*.

In general, the higher the luminous intensity, the more reflection generated. So the surface of a certain object may look very solid and opaque in dark illumination and the same object may look thinner in bright illumination.

(1) Angle and Volume

The angle of light determines the volume and angle of reflection, which in turn determines the volume of light absorbed into an object. For example, when an intensive light reaches the surface of a glossy fabric at a low angle or sideways, most of the light will be bounced

back at the similar angle. However, if the light reaches the surface at a high angle or at right angles to the object, most of the light will be absorbed making the object wear brighter colors.

The volume of light coming from the light source also influences the changes in the color tone, which is represented when light comes in touch with the surface of an object.

(2) Direction and Changes

Light creates different level of brightness of a material and effect of reflection depending on the distance, direction and location of an observer. So even the light coming from the same direction creates different level of brightness and darkness causing a different look to the angle, tension, location and pleat of a cloth in line with the person who wears the cloth.

Direction from which light is coming has great influence over the representation of an object and its pace and the contrast of darkness and brightness reinforces the relations with an object. Light at the right angle to an object shows the silhouette of an object blurring the distinction of different objects, which makes it difficult to feel the distance and volume. However, light shone at the angle of 45° create a deep impression and it is quite effective at describing the details of an object. The lateral lighting generates three-dimensional effect by creating a shadow on the opposite side. It also offers distance feeling, cubic effect and clear sense of direction through the shadow and reflecting light. Light coming from the back emphasizes the cubic effect of an object with the shadow created on the front. Light coming from above underlines cubic effect by enlarging the shade but diminishes the detailed description of an object. Light coming from below is used to create the feeling of horror or instability as it creates unrealistic and fantastic view with along with stark shadow.

III. Changes in the Color Caused by Light in Fashion

Changes in the color resulting from light are affected by the development in the space industry, fabric industry and decoration culture. Different fashions and materials are developed to represent such changes.

1. Changes in the Color Resulting from External Light Source

Fashion materials that represent change in the color in line with the wavelengths of light include holographic vinyl, jewel, sequins or beads shining in various colors. Materials that show different brightness in line with the shade of light are silk, plastic, leather, artificial leather, metal substance (thin metal quilt, lam stainless steel fabric, aluminum fabric), glass, mirror pieces, sequins, beads, jewel, PVC, enamel, etc.

Holographic materials creating a four-dimensional feeling depending on the angle of the view-point allow the viewer to have a new feeling on the texture and surface of a cloth.

Though in a simple silhouette, dresses made of holographic materials create an optical illusion arousing futuristic and fantastic sensation caused by dynamically changing colors.

The color of silk can look smoother and sleeker and its colors change with the bright and dark areas intersected each other. The color of silk, representative glossy materials, is represented in the subtle and soft feel.

Changes in colors by the shades of light are well represented with the leather or artificial leather. Leather has not only the image of the resistance but also cold, sophisticated, modern and sexy look.

Metallic materials show changes in the color with different level of brightness created by shades of light. Metallic textile highlighted as a new materials recently create cold and smooth gloss unlike other materials made of metallic thread. Location of the light, the way that fabric is woven determine the angle of reflection creating diverse glossy touches.

On velvet and fur, color tones created when light comes from the right side are different from the ones created when the light comes from left. The materials absorb light and generate different feel of surface depending on the movement of the materials.

Materials of reflexive reflection reflect the light. In the past, these materials were used for road signs, reflexive safety vest, police uniform or working garments with the purpose of ensuring safety for people. Today, they have been utilized for different personal items such as shoes, clothes and other accessories, which have gained more popularity.

Glittering materials generate the most dramatic effect of shades. They are used to decorate the cloth either in part or overall. Representative examples are metal, gold, mirror, beads, jewels, embroidery, sequins, etc.

As described so far, wavelengths, shades of light and interaction of the external light source and surface create different color tones on the surface of an object. Representative examples of showing different visible rays depending on the wavelengths of light are holographic vinyl in the rainbow color. In addition, there are a variety of materials that can show the changes of brightness in line with the shades, which allow people to enjoy different color tones. The range varies from the brilliant rays from shining metal, subtle and soft luster of silk, to glitter of sequins or jewels. They all create different and unique images through absorption or reflection of light. The silver color like aluminum is utilized for the cool and modern items while the vinyl colors are used to create quite sexual and enchanting images.

2. Changes in Colors by the Internal Light Source

The fashion materials and decoration items representing the internal light source include illumination patterns, ray decorations and fluorescent materials.

One of the representative examples of showing changes in the color caused by internal light source is radiation. Fashion designs based on the concept of radiation generate dazzling and dizzy visual changes by juxtaposing complementary colors or by stimulating

the visual sense and perception of an observer. Materials that can create this effect are ray decoration, fluorescent or phosphorescent substances.

In fluorescent substances, photons are radiated from part of its atom energy and combination of rays with this creates a very bright light. Once the energy source disappears the fluorescent substance is recovered to its original state, which means that its effect can be maintained only when there is sunlight. It does not look bright under artificial light. Phosphorescent substance, however, shines brightly under artificial light as well as under the sun. As it gradually recovers to its original state once the light rays disappear, it radiates light over a certain period of time even after the energy source is gone. The intensity of residual light and duration differ depending on the type of phosphorescent substance, intensity of radiant energy, and duration of lighting. Those materials what well call noctilucant substance, which radiates bright lights at night, are mostly made of phosphorescent substances.

As described so far, different color tones are created depending on the wavelength of light, its shades and interaction of light and materials.

IV. Conclusion

In the contemporary fashion design industry, we have various different approaches that can express colors and materials thanks to the development of digital technology. While the main design element that determined the changes in the fashion was the form in the past, feel of texture and color tones have recently emerged as important element that can create diverse changes in colors utilizing light.

This paper examined the changes in the concept of color caused by light. In the fashion design, changes in colors are represented in the expansion of variable and consecutive spaces using light effect of reflection or artificial illumination.

The changes in colors by light studied in the paper can be summarized as follows:

First, in fashion different colors by the beholder depending on the object, vision of an observer, and light source. Vivid visual changes are created on the surface of an object in the process of interaction of the light with the surface structure of a substance, which is represented in the form of penetration, reflection, absorption and other reactions of light.

Second, the patterns of color changes can be grouped into two types: one resulting from the interaction of the surface of an object with an external light source and the other an internal light source where light matches the surface of an object. The changes in colors by light generated in the process of an interaction with an external light source can be further classified into the changes in colors depending on the wavelength of light and the changes in the brightness depending on the volume and angle of light. Radiation is the representative example to show changes in color caused by an internal light source, in which the light source itself brings change to the color of surface of an object. This refers to

the case when the substance itself has an element of radiating light.

In fashion, changes in the color create aesthetic beauty meeting the desire of people who wish to look more beautiful. People find delight and pleasure using various materials based on the light and the desire to make oneself look more beautiful has intensified over time. This has led to ceaseless artistic experiments and development made over the centuries using various materials that interact with light. This also allowed us to express the places where we live and cultural values that we have in a more artistic way and motivated us to create beautiful items and drove innovation, bringing more pleasure and inspiration to other humans.

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