Analysis of the Material and Function of the Mask under Viral Infection

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Abstract. In recent years, air pollution is more serious, mask production has increased year by year, especially in January 2020, the emergence of a new coronavirus attack, masks on health and quality requirements are more stringent. It was found that under the influence of the current epidemic situation, there are different types and functions of face masks, and there are many defects in production. On this basis, the topic of the mask on the practical features, color configuration, interpretation of the meaning and process production, and other aspects of research and analysis, and in view of the current mask in life application, the following viewpoints and opinions are put forward: 1. The mask material is imitated, transplanted, extracted, changed and applied in modern mask design; 2. Absorb the symbolic colors of the mask or adopt the reverse color collocation which breaks the routine, and provide inspiration and inspiration for the mask design in modern life; 3. Draw lessons from the traditional manufacture technology and combine the modern processing technique, create new and diverse style features.

Introduction

China has the highest rate of mask use in the world. In ancient times, people in the imperial palace covered their mouths and noses with silk scarves to prevent dust and pollutants from being inhaled. In the Yuan Dynasty Palace, people who offered food covered their mouths and noses with silk cloth to give them breath without touching food. The use of Silk Cloth also became the forerunner of the modern face mask. The mask has been used in the medical field since the late 19th century, when German pathologist Ledeč explained its role to medical workers to prevent bacterial cross contamination in the environment. At the beginning of the 20th century, face masks gradually became a common carry-on item in daily life. By the mid-to-late 20th century, masks had become significantly more frequently used in the home, and in past pandemics they had become important in preventing and isolating the spread of the virus. The current mask standards on the market mainly include GB19083-2003"technical requirements for medical protective masks", yy0469-2004 "technical requirements for medical external masks", Aq1114-2004"coal mine self-suction filter dust mask" and GB2626-2006" self-suction filter anti-particle suction machine”, etc., are Industry standards. Under the regulation of mask production, the mask material must be filtered as a percentage of aerosol particles with a diameter of less than 1 M. Generally, sodium chloride particles are used as the detection index of non-oil particles, CMD is 0.075 ~ 0.020 M, MMAD is 0.24 ~ 0.06 m, which reflects the filtering effect of the mask on submicron particles, the better the mask will filter the particles.

Analysis of Research Status

Analysis of the Present Situation of the Application of Face Mask Materials

Because of the high risk factor of 2019-ncov, masks are an indispensable protective device for all people. They can be worn over the mouth, nose and Chin of the user, as well as in different environments, it can also block the mouth and nasal cavity or the pollutants emitted, the mask should
be able to protect the mouth and nose safely and firmly, cannot choose recycled materials, cannot use materials containing high toxicity, carcinogens and other materials, cannot use the skin irritant materials. In these characteristics and special requirements, the first choice is non-woven materials, non-woven fabrics with moisture-proof, breathable, flexible, light weight, non-burning, easy to decompose, non-toxic non-stimulating, rich color, low prices and so on. For example, most of the masks are made of polypropylene PP material, which is produced by one-step continuous process such as high temperature melting, spinning, sizing and hot rolling coiling. Non-woven fabrics without warp and WEFT, cutting and sewing are very convenient, and easy to form, so it is very popular with craftsmen. Because it is produced without the need for spinning and weaving to perfect the fabric, it can be short textile fibers or filaments randomly or fixed arrangements to form a fiber network structure, fabric then reinforced by mechanical, thermal, or chemical methods. Table 1:

Table 1. Properties of nonwoven materials.

<table>
<thead>
<tr>
<th>Advantages of non-woven materials</th>
<th>Disadvantages of non-woven materials</th>
<th>Process characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Weight: Polypropylene Resin as the main production raw material, the proportion is only 0.9, fluffy, feel good</td>
<td>Poor strength and durability compared to textile fabrics</td>
<td>In the production, the process flow is shorter</td>
</tr>
<tr>
<td>SOFT: made of fine fibre 2-3D, it is formed by hot-melt bonding of light spot. The finished product is soft and comfortable</td>
<td>Can Not repeat cleaning, easy to damage</td>
<td>High production rate</td>
</tr>
<tr>
<td>Air PERMEABILITY: water content is zero, the finished product drainage performance is good, it is composed of 100% fiber, with porosity, good air permeability, easy to keep the fabric clean dry, easy to clean</td>
<td>The fibers are arranged in the same direction and are therefore prone to cracking at right angles. The improvement of production method mainly focuses on the improvement of preventing splitting</td>
<td>High yield</td>
</tr>
<tr>
<td>NON-TOXIC, non-irritating: The product is made with food grade materials in accordance with FDA. It does not contain other chemical ingredients, has stable performance, non-toxic, no odor, no irritation to the skin</td>
<td>China's non-woven hot-air glue production line is not perfect, product quality can not be compared with European and American products</td>
<td>Low cost</td>
</tr>
<tr>
<td>ANTI-BACTERIAL AND ANTI-CHEMICAL AGENT: polypropylene is a chemical blunt material, is not borers, can with the liquid bacteria and insects corrosion isolation; anti-bacterial, Alkali Corrosion and finished products will not be affected by corrosion strength</td>
<td>Polypropylene’s chemical structure is not firm, the molecular chain is easy to break</td>
<td>The variety of post-processing is less</td>
</tr>
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</table>
At present, the domestic research and development of nonwovens mainly focus on new raw materials, functional finishing technology, new production equipment, on-line composite technology and other fields. With the development of non-woven technology, the product performance is improved, and the quality and function meet the demand of more and more fields, so the downstream market is expanded and the whole industry is upgraded.

Under the new situation, the design requirement of the face mask sealing is added, the filtering efficiency of the face mask is graded, the requirement of the face mask size and nose clip length is deleted, and the design should be carried out according to the structure, form and sealing mode of the product.

**Selection Criteria for Face Masks during Epidemic Prevention**

Because of the influence of 2019-ncov, face masks have become an essential protective device in everyone's life. Masks play a role of blocking and filtering, from the current situation of people buying masks to analyze, the masks are mainly medical non-woven masks, daily protective masks, KN95 masks, KN100 masks, KN90 masks, full face masks and activated carbon masks. According to the division of environment and function, hospitals use more blue non-woven masks, and now many are used at home, which can mainly play the role of anti-virus; the main feature of activated Carbon Masks is the activated carbon in the interlayer, can effectively prevent bacteria and dust; N95 mask more reliable in anti-haze; the above are the new coronavirus used more protective gear.

**Rich Color Arrangement—Breaking the Traditional Reverse Thinking Color Arrangement**

From the analysis of the current situation of the mask, the market appeared colorful, gorgeous, fashion, environmental protection, widely used, beautiful and generous patterns, some materials wear more light, environmental protection, recyclable. During this epidemic, the appearance and color of the mask are various. The non-woven fabric used for mask is a kind of good environmental protection material because of its pearl-like appearance, also called Pearl Canvas.

**Still White as ever**

ACHROMATIC mainly has black, white, gray, is the harmonic color and the transition color in all color collocation, is the wild color, in the overall color plays the role is the harmonic and the collocation function, the scientific color collocation, the aesthetic effect can be twice the result with half the effort. But in the design, white has also become the common face mask color of this epidemic, white does not add any chemical dyes, is a safer color, but in people with the process, the front and back are easily confused. White masks can be distinguished by the following features:

First, it can be distinguished according to the head of the front and the back. During the wearing process, the side with the head of the white face mask is the outer side, while the side without the head is the opposite. Second, it can be distinguished according to the degree of smoothness, the outer layer of the mask has the function of blocking water, most of which are smooth surface, while the inner layer is made of breathable material, close to the skin, conducive to inhalation, more delicate comfort.

**A Rainbow of Colors**

The colorful color scheme is the eternal theme of the mask, which shows the artistic characteristics. Under the influence of the 2019-ncov, it is to increase the vitality of the non-woven mask, and also
to highlight the vitality of people, in the design of different colors to highlight the aesthetic effect of the mask, and high-quality color splicing and integration, so that the color changes in line with the aesthetic law, showing a better aesthetic height. Color selection of red, green, blue, purple and other colors, and with other patterns as a harmonious color, think that the natural world of color are spiritual. Highlight the diversity of color mask, but also highlight the spirit of people's pursuit of beauty, "beauty in the red and green, wonderful in the antique" fashion and practical.

Influenced by covid-19, a large number of fashionable color masks have emerged in the market. From the perspective of materials, many of them are made of chemical fiber fabrics after chemical treatment, and their patterns and colors are also dyed with dyes, which are irritating to some extent and have poor air permeability. Although the use is more beautiful, but there are some security risks.

A Color Scheme that Breaks the Rules

Reverse processing of traditional colors is a creative design method. In fact, this method is common throughout the field of art. White and blue are the traditional colors of non-woven cloth masks. While respecting and learning from them, we also designed a fiery red and a noble purple, which are respectively blended from the hue, lightness and purity of the colors, and the traditional color matching ratio is subvert and reversed, so as to obtain an innovative design. At the same time, it also meets consumers' demand for beauty. Such as a line of crew members, cabin department according to the China Eastern characteristics "of green" uniform "magenta" design concept, with "tall" silk material carefully built a delicate and elegant, full of Oriental charm "mask", choose the lilac in color, light blue, orange color to highlight color characteristics of masks, and according to the professional to join the iconic design. See table 2 and table 3

<table>
<thead>
<tr>
<th>Pure color</th>
<th>Implicative color</th>
<th>Calm color</th>
<th>Green color</th>
<th>Calm color</th>
<th>Excited color</th>
<th>Warm color</th>
</tr>
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Table 2. Masks of Oriental charm.

Table 3. Color comparison table of various masks.
The Exquisite and Gentle Technique Provides Reference for the Design and Manufacture of Modern Masks

Masks are a necessity in our daily life. A medical non-cloth mask is made by gluing fibres together directly through physical or chemical means, and it cannot pull out a single thread. The fibers used in the production of nonwovens are mainly polypropylene, polyester, polyamide fiber, viscose fiber, PVC, nylon and other materials. It can be divided into:

Table 4. Characteristics of production process and equipment.

<table>
<thead>
<tr>
<th>Medical non-woven cloth production process</th>
<th>Equipment for mask production</th>
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<tbody>
<tr>
<td>The spiny process squirts water at high pressure onto one or more layers of fibers, which become intertwined.</td>
<td>Semi-automatic production process: need flat face mask flaking machine, ear band welding machine</td>
</tr>
<tr>
<td>Thermal bonding nonwovens refers to the addition of fiber or powder in the fiber mesh hot melt bonding materials, after heating, melting, cooling reinforcement into cloth.</td>
<td>Automatic production process: one - tow two - plane mask machine or one - tow three - plane mask machine</td>
</tr>
<tr>
<td>Wet non-woven cloth is the fiber raw material in the water medium is opened into a single fiber, then mixed, made of fiber suspension slurry, fiber in the wet state into a network and then strengthened into cloth.</td>
<td>Hd-0301 plate mask machine, duck mouth mask machine, folding mask machine</td>
</tr>
<tr>
<td>Melt spraying non-woven cloth is to feed polymer, melt out, fiber formation, fiber cooling, net, reinforcement into cloth.</td>
<td>The three layers of non-woven material are superimposed by the machine. Curl the edges and sew the nose in</td>
</tr>
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</table>

Traditional mask equipment is only responsible for mask body molding, SMT machine and ear welding subject unit, the efficiency of the host high (120-150/min), ear with low efficiency of welding machine (40-60/min), non-woven masks, traditional production process is non-woven raw materials on masks fumo machine rack, after debugging mask piece, automatic production machine, and then take masks to transfer to the ear phone for belt, was formed out of the finished product, package again. This is a semi-automatic machine production process that requires 3-6 human operators (1 machine + 2 ear strap machines). In addition, combined with modern full automatic machine production, labor saving, raw materials are hung on the material rack, the machine automatically feed, a host drag 2-3 sets of ear belt machine for automatic production, only 2-3 people to operate.

To sum up, as consumers demand for daily respirator products continue to increase, the market daily respirator product variety, quality, therefore, the choice of the mask must go through the certification authority, has enough filtration efficiency of products, at the same time, also should...
choose to suit oneself face shape and fit of the products, were not exposed to infectious material if masks, you can reuse several times, such as the nose clip damage, deformation of masks, have peculiar smell, must be timely replacement.

After the impact of the new coronavirus, people have a deeper understanding of the choice of mask materials and functions. Masks come in a variety of styles, but they should be practical and safe.

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