

Research and Countermeasure Analysis on the Post-processing Scheme of Medical Materials-- taking the mask as an example

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Abstract: At present, China pays more and more attention to environmental pollution and resource consumption, and energy conservation and emission reduction has become the top priority of the country. Under the influence of novel coronavirus, masks have become a necessity in people's life. In this era of "environment-friendly society" and comprehensive, coordinated and sustainable development, it completely runs counter to the concept of the development of the times. This paper focuses on the research of mask materials, the disposal and recycling of masks after use, and the destruction methods of masks, in order to find better replacement materials and destruction methods.

1. Introduction

The sudden outbreak of public health events in 2020 has affected the hearts of people all over the world. The spread of the epidemic is faster than we thought. In order to actively respond to the epidemic and do a good job of self-protection in the epidemic, the use of disposable medical masks has soared. From the production of masks and the recovery and destruction of masks will cost a lot of manpower and financial resources. At present, domestic environmental pollution problems emerge one after another, and the deterioration of the ecological environment always reminds people to protect the environment. The purpose of this paper is to find a method to deal with the mask.

2. Study on Mask Materials

2.1 Material and function of each layer of mask

(1) Middle filtration - melt-blown non-woven fabric

Meltblown cloth is the core material of the mask. Meltblown cloth is mainly made of polypropylene. It is a kind of ultrafine electrostatic fiber cloth, which can capture dust (droplets containing pneumonia virus near the meltblown non-woven cloth will be electrostatic adsorbed on the surface of the non-woven cloth and cannot be penetrated). The microfiber with unique capillary

structure increases the number and surface area of the fiber per unit area, so that the meltblown cloth has good filtration, shielding, thermal insulation and oil absorption. It can be used in air filtration material, liquid filtration material, isolation material, absorption material, mask material, heat preservation material, oil absorption material and wiping cloth and other fields.

(2) The outer layer anti-foam, the inner layer anti-moisture - spunbonded non-woven fabric, is composed of fibers.

Advantages: aeration, filtration, water absorption, waterproof, feel good, soft, light.

Disadvantages: can not be cleaned.

(3) Additional structure: nose bridge strip

A thin adhesive strip inside the mask is used to fix the mask to the bridge of the nose. Adopt environment-friendly plastic strip, without any metal, with breathable and comfortable.

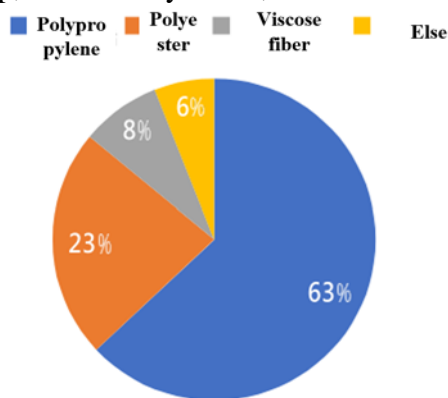


Figure 1: Non-woven main raw materials

2.2 Analysis of substitutability and recoverability

(1) Replaceable and irreplaceable

a. A substitute for spunbonded nonwovens

Spunlaced non-woven fabric is a substitute for anti-stick non-woven fabric. It is a natural pure plant cellulose, which can be decomposed by itself after one-time use, and will return to nature without causing any pollution to the environment.

b. Alternatives to mask meltblown cloth

Electrospinning nanofiber filter material can be used as a substitute for mask melt spray cloth. It has very high specific surface area, porosity and permeability, and is easier to adsorb and separate tiny particles. It can be used as a variety of high-precision and high-performance filter materials, and has a wide application prospect.

(2) Recyclable and unrecyclable

The metal fastening strip above the ordinary medical mask can be removed and recycled according to the metal type. The elastic headband can also be collected for personal use. However, the mask part is composed of multiple materials and belongs to biochemical pollution products, so the recycling value is not high and the difficulty is great.

3. Current treatment methods of masks and energy utilization

3.1 How to handle the mask

In rural areas, the disposable masks are treated in a simple and rude way by ordinary people, who simply throw them into garbage cans or landfills, or even throw them away everywhere. This

treatment of masks poses a huge social and environmental hazard in the face of this epidemic. However, in urban and county areas, each district has taken corresponding measures for the disposal of disposable masks, dividing four categories of discarded masks into specifications. In general, disposable masks should be used for 4 hours, and it is best to replace them once. After a long time of use, masks themselves become a way of spreading diseases.

3.2 Energy utilization in cover destruction process

It can generate electricity through combustion, such as Hubei Huangshi Waste Incineration Power Generation Project and Liaoning Dalian Waste Incineration Power Generation Project. However, because the calorific value of medical waste such as masks is higher than that of conventional domestic waste, the mixed burning of medical waste in the domestic waste incinerator will inevitably make the boiler overloaded. Secondly, a variety of bacteria and viruses attached to masks are also a major problem in the burning process. Therefore, there are several things to be sure when burning masks to generate electricity.

(1) Designated special area furnace, strict elimination and killing, to ensure epidemic prevention safety;

(2) Strictly prevent infection and ensure standard discharge;

(3) Incineration of epidemic waste, mainly to fully kill the virus and prevent the leakage of the virus; Monitoring data indicated that the furnace incineration temperature as high as 900°C, fully equipped with the conditions for the inactivation of novel coronavirus.

(4) For the incineration of masks and other special epidemic waste, increase the input of lime slurry and activated carbon required for flue gas treatment to ensure the standard discharge.

4. Current treatment methods of masks and energy utilization

4.1 The improvement of mask recovery in towns and other areas

Unlike hospitals or communities, there are no special waste mask recycling bins or even waste mask recyclers in rural areas, so it is difficult to implement the recycling of masks, and people in rural areas lack the awareness of mask recycling.

Therefore, the improvement in rural areas is a process from scratch. First of all, the management system of waste masks in rural areas should be improved: the village committee should be taken as the unit, and the village head or secretary should be taken as the leader to take charge of the recycling of waste masks. Special waste mask recycling stations should be set up and people should be assigned to manage them.

4.2 An independent and harmless method of destruction by individuals or small groups

(1) Invention Patent of a disposable mask that is easily destroyed:

The quoted invention patent relates to the principle of a disposable face mask which is easily destroyed. The cited invention patents can achieve the following functions through a series of innovative designs. In the initial state, the mask is folded. When the mask is unrolled, the dye flows out to be stained and the mask structure is opened. When the disposable mask is not used temporarily, the disposable mask reverts to the folded state.

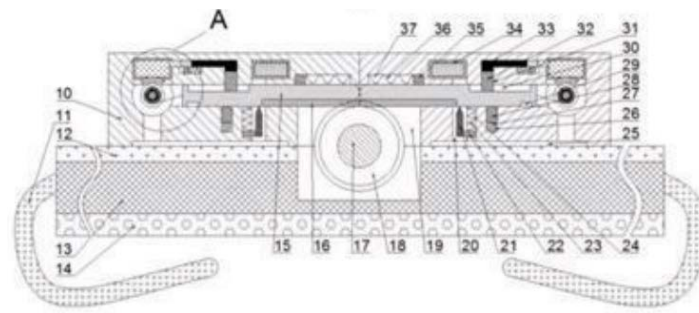


Figure 2: The invention patent of disposable mask which is simple to destroy

(2) Personal disinfection measures based on an easily destroyed disposable mask invented in the citation:

(a) Alcohol disinfection: Alcohol disinfection is a common method and can only be used on thick masks to remove bacteria from the surface.

(b) Heat source disinfection: Put the mask into a sealed glass bottle and seal it well. Boil the mask with boiling water for 10 minutes. If there is a radiator at home, you can place the mask on the radiator and bake it at high temperature for half an hour to one hour.

(c) Ultraviolet disinfection: using the ultraviolet light of the sun can be disinfected. In addition, they can also be disinfected with ultraviolet light, which creates ozone to kill respirator germs.

4.3 Change the way of mask destruction by replacing the material of the mask to achieve energy saving and emission reduction

The decomposition of different material layers of disposable medical masks is very convenient. In addition, the existing technology can fully realize the automatic decomposition process of different materials of disinfected waste masks. Compared with the existing scheme, it can omit the burning process, which is generally achievable in environmental protection and economy. Therefore, we conducted an analysis of alternative materials:

A. Alternatives to spunbonded nonwoven fabrics for face masks

Spunlaced non-woven fabric through spunlaced technology does not exist on the extrusion of the fiber net, and can be made composite with any base cloth composite goods.

B. Alternatives to mask meltblown cloth

Electrostatic spinning of nanofibers filtering material is renewable, in the actual filtering process, most of the impurities will stay in electrostatic spinning of thin film surface, will only rarely part of other particles in electrostatic spinning inside and bottom sediment.

5. Conclusion

This paper takes the commonly used disposable masks as the investigation object, and makes a detailed supplement to the materials and materials of disposable masks. In the face of the prevention and control stage of the epidemic, people can not wear disposable masks in their daily life. It is greatly convenient for people, while it is accompanied by the disposal of abandoned masks, such as the possible secondary infectivity caused by discarded masks and the huge environmental pollution caused by them. Once in the exploration of different applications of mask processing and energy transfer, get the improved way of mask treatment.

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