Material Analysis and Design of Air Purifier

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Abstract. With the development of economy, the damage to the environment caused by industrial development is becoming more and more obvious. When people pursue material and spiritual matters, it is inevitable to consider the improvement of air quality that is closely related to our life. In order to improve the air, appeared on the market many air purifier, hoping to improve air quality in a certain space. Air purifiers have attracted people's attention once they are on the market, and businesses are constantly improving air purifiers to meet people's different needs and improve the competitiveness of products. With the aim to study the air purifier, the shape size, molding materials, processing technology and so on has carried on the thorough analysis, it is concluded that the link between design and material molding and processing technology.

1. Introduction
Sunshine, air and water are essential to life. These things that play an important role in our lives are slowly changing. The ozone layer is destroyed and global warming occurs. Pollution of domestic water sources due to large amounts of untreated sewage discharge. Even the air is no longer pure because of the wanton discharge of industrial gases. People began to try their best to prevent and change, so air purifiers came into being.

2. Types
There are many kinds of air purifiers on the market at present. They all choose one or more existing materials and technology combination.

   According to the principle of purification, air purifier can be divided into two types: filtration adsorption purifier and catalytic oxidation type purifier. Filtration adsorption purifier filtration, it is mainly aimed at harmful gases and pathogenic microorganisms in the air, It cleans the air by producing substances with catalytic and oxidative decomposition and reacting, It is mainly aimed at harmful gases and pathogenic microorganisms in the air.

   Air purifier according to product technology is divided into air filter type air purifier, water medium air purifier, ionization type air purifier, ozone air purifier, photocatalytic air purifier, compound type air purifier.

   Air purifier according to the product form is divided into vertical cabinet type air purifier, wall-mounted air purifier, hung ceiling type air purifier, desktop put type air purifier, wearable air purifier, through-wall type air purifier.

3. Material Analysis
In the selection of materials, mainly through the two parts of external shell of the air purifier and the internal screen pack to analyze the different materials for air purifiers in the market.
### 3.1. Internal Filter Net

Nearly 1000 kinds of air purifier products, although the focus of brand promotion is different, but there are four ways of core purification technology. Each purification technology has its own advantages and disadvantages.

**Physical Filtration.** First layer, initial effect strainer, it is generally made up of special polyester fibers, it looks lighter, thinner and a larger mesh opening.

Second layer: Activated carbon strainer, it uses the through-hole structure of aluminium honeycomb, plastic honeycomb, paper honeycomb as the carrier. Honeycomb activated carbon filter is made in polyurethane foam to upload the attached powdered activated carbon, its carbon content from 35% to 50%.

Third layer: HEPA strainer, it is made of laminated borosilicate microfibers, like paper.

Fourth layer: Formaldehyde strainer, it is the combination of activated carbon and micro fiber.

**Plasma Dust Collection Strainer.** This filter adopts unique patent design, it is composed of high voltage power supply, the corona wire and dust collection panels. It uses a cellular metal material dust, it has light weight, large contact area, low wind resistance, and dust collection effect is good, is it convenient to maintenance cleaning.

**Photocatalytic Strainer.** Photosensitive medium strainers can decomposition of toxins from bacteria or fungi and innocent treatment. at the same time it also have deodorization, anti-pollution, purify air, etc. Photocatalytic strainer is basic material with aluminum honeycomb, polyurethane, nickel base. Its material and coating technology will affect the performance of the Photocatalytic strainer.

**Electrostatic Dust Collection.** Flow large electrostatic air filter material with the new filter material HAF, it is a large space air purification balance filtration efficiency and pressure difference of the best solution. Micro replication technology ensures the HAF filter material large filter surface area. Electrostatic electrets technology ensures the high charge density and durability.

Nanofiber technology using electrostatic spinning production will be 0.2-0.3micron nanofibers continuously spray on the surface of the filter material, to form a layer of thin and breathable nanofibres, the dust on the surface effectively intercept down. Excellent filter material more efficient capture of submicron dust particles. Enhance the surface of the filter, better use of the effect of the pulse dust removal, to use less energy and use less compressed air. Dust particles collected on the surface of filter material, it is easy to fall off in the opposite direction to blow it, however, base material keep clean.

### 3.2. Outer Shell

Small air purifier shell for ABS plastic in general, It not only can reduce cost, easy to make a streamlined, noise reduction, and plastic will not rust, and more durable, but it need to invest more processing.

There are studied experimentally with processed into the shell, the surface processing of baking varnish, Beautiful but the high cost. Also have spray paint processing, low cost, more often used in large purifier.

Also have used metal shells or decoration, its processing is more complex, and restrictions are more than the plastic shell. After the completion of the initial shape making, in order to beautiful is generally going to spray paint, not as good as plastic wear-resisting. In addition to using acrylic as shell.

Choose what kind of material as the shell of the air purifier purify ability won't produce very big effect, shell material is mainly influence on the appearance is beautiful and production process, impact on production costs and heavy capacity, because of the air purifier purify ability key or internal motor and strainer.

### 3.3. Stool

In order to make the air purifier realize lower intake and strengthen the stability of air purifier, so add benches and top boards at the bottom, It chooses wood-rubber wood in material.
Rubber wood is abundant in Southeast Asian countries, domestically produced in Yunnan, Hainan and coastal areas. The trunk of rubber tree is the raw material of latex. The economic life span of seedlings is 15-20 years, the growth life of budding trees is about 20 years, its wood structure is thick and uniform, the texture is oblique and the wood is hard, it is recognized as one of the most widely used light hardwood solid wood in the world; Its colour is light yellowish brown, obvious rings and dark belt, pipe holes very few.

Actually, rubber wood as a new material for home wood products, because of its unique decorative effect, popularized price makes it a high cost-effective variety in furniture industry; it is loved by more and more consumers.

4. Use Place

In many cases, it is particularly important to equip air purifiers.

The hospital is a place for treating patients, every day a lot of personnel flow inside, virus infection fast, in addition to the regular disinfection, if can be equipped with medical grade air purifier for air purification, for environmental disinfection, is also very necessary.

Newly decorated house has a lot of health hazard substances formaldehyde, benzene and benzene series matter. This harmful material has been confirmed by the world health organization for cancer and deformed material, long-term exposure can cause various respiratory diseases and serious diseases, such as leukemia. If you can provide air purifier, can accelerate the speed of toxic substances in air lift, reduce the risk of disease.

Owing to the smell of unused new car seat cushions or other parts that have been disassembled cannot be eliminate, it can cause drivers to have chest tightness, dizziness and nausea, use of on-board air purifiers can accelerate the flow of air and purify the air in the car.

5. Structure Design

5.1. The Overall Appearance

Air purifier when the sense that gives a person a kind of sweet and trustworthy products, because it brings the fresh air. According to the product brings a person the feeling, it is different from the market often used in the design of the square, and adopted a more rounded the curve. Design inspiration from the animation image, its round curve and lovely expression made people feel soft and considerate. Such a round shape can make the product look more trustworthy, on the desk is a lovely place adorns, and is shown in Figure 1.

5.2. Switch Design

On the design of the key by a key switch, with the icon instructions, make it simple and clear. In order to meet the needs of different users to purify air, air purification can be divided into three grades, users can decide for themselves.

5.3. Power Supply Mode

The design of the air purifier usage scenario is in office or in a small space, set it way of electricity to the USB connection. Compared to the user cannot clear forecast when using longs a battery-powered, USB power supply more convenient.

5.4. Air Intake

The air inlet of the air purifier for the lower end of the air purifier, in order to make it smooth admission, add the middle hollow out in the end of a small stool. On the one hand, can make the air inlet air intake from below; on the other hand, and to further hold the air purifier.
6. Conclusion
Through this design to do a detailed prephase research and variety of air purifier market, purification methods, etc, and conducted a series of measurement, statistics and analysis, as well as to the air purifier in the materials used in production, molding process are analyzed. After the work, realize the design originated from life eventually into life.

We want to design a good product, not only need to innovate, more important is when the design to meet the needs of using groups, at the same time, also want to have technical support. Design, make life more beautiful.

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