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Reusable and Rapidly Manufacturable Face Mask for Air Filtration in Hazardous Environments

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Background

In the midst of the COVID-19 pandemic, personal protective equipment (PPE) amongst medical personnel have become sparse and difficult to obtain. As a result, in the early weeks of the pandemic, medical and first responders wore N95 and other similar masks for periods of time much longer than the masks designs intended. Prolonged use of these one-time use disposable PPE products has also resulted in skin abrasions, bruising of the face and ears, and high contamination risk. In addition, many of these PPE masks do not create a sufficient seal around the user's face, which counterproductively allows unfiltered air to be drawn in.

Invention Description

Researchers at Arizona State University have developed a new mask designed for personal use as an aerosol particulate filter. It is worn on the face, enclosing the mouth and nose, creating a sealed environment to maximize the amount of clean, filtered air breathed in by the wearer. Specifically designed to be manufactured using accessible methods and materials, the mask enables more rapid production compared to traditional methods. The main mask body is intended to be efficiently 3D printed, with the addition of a removable seal made of a soft and flexible polymer such as silicone. Anchor points on the mask allow for various elastic band options, and the mask front can be customized to accommodate different filter systems. Intended for comfortable long-term use, the mask can be sterilized and reused according to the material properties of the components.

Mask components

Potential Applications

- Face masks for hazardous environments (e.g., bacterial contaminants, aerosol chemicals, dust)
- Printable PPE masks

Benefits and Advantages

- Accessible to multiple manufacturing processes, from rapid 3D printing to large-scale injection molding, allowing both average consumers and large manufacturers to produce the mask according to need
- Versatile, modular design can be tailored to specific applications
- Comfortable for long-term use
- Can be sterilized and reused
- Seal enclosing the mouth and nose ensures filtration efficiency

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