flextrapower

The Science Behind Flextrapower's Advanced Filtering — And Why Other Masks Fall Short

The Flextrapower Graphene Mask is a reusable, comfortable, and breathable mask for sustainable public health. Read more about the science behind its graphene-infused filter.

Wearing a face mask reduces the risk of transmitting contagious respiratory illnesses. In the months since the COVID-19 outbreak, mask compliance has become increasingly important to slow down and stop its spread. Yet in the U.S., face masks continue to be a controversial topic. This poses an especially dangerous risk in the west where face mask usage is not regarded as common practice.

In Asian countries, such as China and Japan, masks have been tools of community-wide protection since the early 20th century. More recently, the 2003 SARS outbreak had a lasting effect on the public health practices of most Asian countries at the individual and community levels. **The widespread use of face masks in Asian countries has related directly to a decreased rate of transmission, serving as an example for Western countries where mask usage is still in a stage of mass stigma** [1]**.** Major factors contributing to this stigma include appearance and style, comfort, and breathability. A gap exists in the face mask market between disposable masks (comfortable, but not that effective) and N95 masks (effective, but tough to breathe) to meet the demand for masks that achieve both.

N95 respirators, the gold standard for pandemic protection, are suitable only for a fraction of the population. The filtering mechanism driving the function of N95 respirators is a grid of nanoscopic pores capable of blocking viral particles—but not without impairing your ability to breathe naturally. N95 respirators are not recommended for children, the elderly, people with asthma, or even those with mild respiratory conditions.

Furthermore, N95 respirators require a fit test to ensure proper function. The airtight seal provided by the fit test can prevent air from entering through gaps but is extremely uncomfortable to wear for prolonged periods due to the tightness of the sealing edge around the wearer's nose and mouth.

As many N95 respirators are designed for professionals in the construction industry, some feature one-way valves that allow a wearer to exhale air naturally while the valve filters dust and fine particles from inhaled air. These N95 respirators, however, are particularly detrimental to public health as they appear to offer ultimate protection, while allowing a wearer's exhaled air to enter the ambient air unfiltered, thus defeating the original purpose of public mask usage. N95 respirators are not the right solution for public health nor consumer health.

There are other face masks on the market with replaceable filters, but none are composed of antiviral materials. Activated carbon and silver-coated fibers are two common materials currently used in replaceable filters. However, neither are truly antiviral. Activated carbon filters may be effective at filtering bacteria, fungi, and pollution, but can only filter 10-20% of viral particles.

While silver has been shown in studies to have some antiviral properties, silver-coated fiber filters cannot effectively block viral particles because every single fiber of the filter would need to be coated in silver which is 1) expensive and 2) difficult to breathe through. At best, these filters are antimicrobial; neither activated carbon nor silver-coated fiber filters are rated to protect against harmful viruses.

The Flextrapower Graphene Mask takes a different approach. This is what makes our mask different:

1. **The mask is thoughtfully manufactured and safe to wear**

   Our unique manufacturing process prevents graphene particles from delaminating from the filter surface. Inhaled graphene yields no significant immune response and graphene has a NOAEL (No-Observed-Adverse-Effect Level) of no less than 1.88 mg/m [2] [3]. Increases of lavage markers indicative for inflammatory processes and microgranulomas were observed at a graphene exposure concentration of 10 mg/m^3, orders of magnitude higher than the concentration of graphene in our masks [4]. Graphene Oxide (GO) is actively being studied as a highly favorable, biocompatible carrier for advanced drug delivery. In layman's terms, this means the mask with its graphene filter is safe to wear.

2. **It uses advanced hydrophobic nanotechnology**

   Most mask filters on the market are driven by a physical barrier (minuscule pores) that prevents particles smaller than the designed pore size from permeating through the filter. Flextrapower's graphene filter, however, is powered by a more sophisticated mechanism. Our unique nanotechnology exhibits a natural hydrophobicity, enabling the filter to actively repel microdroplets and prevent them from adhering to the filter surface [5]. Because microdroplets can't stick to the filter's surface, the need to engineer exceptionally small pores is eliminated. Harmful virus-carrying microdroplets "roll off" the mask

(meaning it can't adhere to, and therefore can't penetrate), and air flows through the filter material unhindered. This fact, combined with the strength and flexibility of graphene, allows us to create a mask that can effectively filter viral particles without sacrificing breathability.

3. The mask is antiviral, not just antimicrobial

Our mask's dual-layer filter is composed of a strong textile backing with a proprietary graphene coating on the top layer. While our graphene's bulk hydrophobic behavior drives the majority of the filtering mechanism, there is initial evidence that a second line of defense helps to ensure a user's protection. The graphene layer is composed of a fine film of graphene particles, which when observed up close, look like crumpled pieces of paper. These nanoscopic particles exhibit a special electrostatic charge that has been shown to draw viral bodies to the thin, sharp edge of its sheets where the virus may become damaged and in turn lose its viability [6].

4. The look and feel is premium, with a higher goal in mind

We believe an increased sense of desirability for mask products leads to heightened mask compliance and greater adherence to public health protocols. Four main components of our mask are designed to lead this effort:

- Our mask's outer shell features a fine-knit fabric, giving it comfortable flexibility while retaining its sleek shape.

- Whether combined with prescription glasses or sunglasses, our mask's unique anti-foggy-glasses nose flaps increase a wearer's comfort.
- We've included our softest material where it counts: in the mask's ear loops, to provide an elastic and cushioned support for all-day use.
- The snap rivets on the sides of the mask add both style and function allowing the wearer to personalize their mask and add accessories, increasing both emotional and utility value.

Our attention to detail ensures comfort and fit that can address many facial types while promoting prolonged mask usage.

Wearing a mask greatly minimizes your risk of catching and spreading airborne viruses, but many masks on the market don't meet the critical requirements to protect you from them. This fact, coupled with the estimation that for every confirmed case countless asymptomatic carriers might be unaware, made it critical for us to leverage our unique graphene technology to build this product. We hope that by creating an innovative graphene mask that is both comfortable and effective, we can empower individuals and drive communities to adhere to public health regulations while collectively stopping the spread of COVID-19.

Works Cited

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