New self-sterilizing air filtration technologies could include face masks and ventilation

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With the worldwide focus on coronavirus prevention and transmission, a new type of air-filter that self-sterilizes and decontaminates is being developed at Ben-Gurion University of the Negev in Beer-Sheva, Israel

based on water filtration technology.

The new nanotechnology is based on laser-induced graphene (LIG) water filters that eliminate viruses and bacteria in water. This new concept, engineered for air-filtration could be used in air filters in heating, ventilation and air-conditioning (HVAC) systems or integrated into face masks for a self-sterilizing effect. Most masks will become contaminated during usage, including the N95 respirator mask, and if not properly used or handled, becomes a contamination risk.

LIG is a microporous graphene foam that can be generated on many types of materials. LIG on water filters provide an active protection with simultaneous contamination removal and disinfection. The LIG is already resistant to bacteria and actively kills microbes and viruses using a low-level electric current from a power source. The researchers envision the two-fold protective system applied to air-filtration.

"The bacterial-resistant graphene surface protects against microorganisms so they can't multiply, while the microbes trapped in the filter are eliminated by electrical effects." says inventor Dr. Chris Arnusch, senior lecturer and researcher at the BGU Zuckerberg Institute for Water Research, part of the Jacob Blaustein Institutes for Desert Research.

Dr. Arnusch works on water purification by developing membranes with anti-bacterial and anti-viral properties. For the past five years, he has successfully applied this technology in water treatment applications.

"The material can be completely sterilized by electrical current, thus an LIG air filter has the potential to be combined with state-of-the-art air filtration such as HEPA filters. The filters could add an active layer of protection, as well as prolong the lifetime of the expensive HEPA technology. As a result, hospitals, cars, buildings and public transport

could all become safer spaces.

If such a material is incorporated into a mask a higher level of protection for medical providers, as well as the general population could be possible."

Surgical masks are mainly designed to protect others, and can actually spread bacteria when they become moist or used improperly. An active LIG air filter in a mask would work during inhalation and exhalation, allowing protection for both the wearer and others in close contact, as well as eliminate the risks of handling a contaminated material.

"This new research direction in the Arnusch lab builds upon collaborative research at BGU combining nanomaterials and filtration providing a new solution in our fight against COVID-19," says Doug Seserman, chief executive officer of the New York City-based American Associates, Ben-Gurion University of the Negev. "We hope this new face mask concept can be validated and produced as soon as possible."

The research is being supported by a seed grant as part of the BGU COVID-19 Response Effort, one of 50 initiatives funded. These each require financial support, and AABGU has announced its commitment to raise emergency funds, enabling BGU to participate fully in the world's efforts at mitigation and containment. Contributions can be made online at www.aabgu.org/donate-covid-19

Provided by American Associates, Ben-Gurion University of the Negev