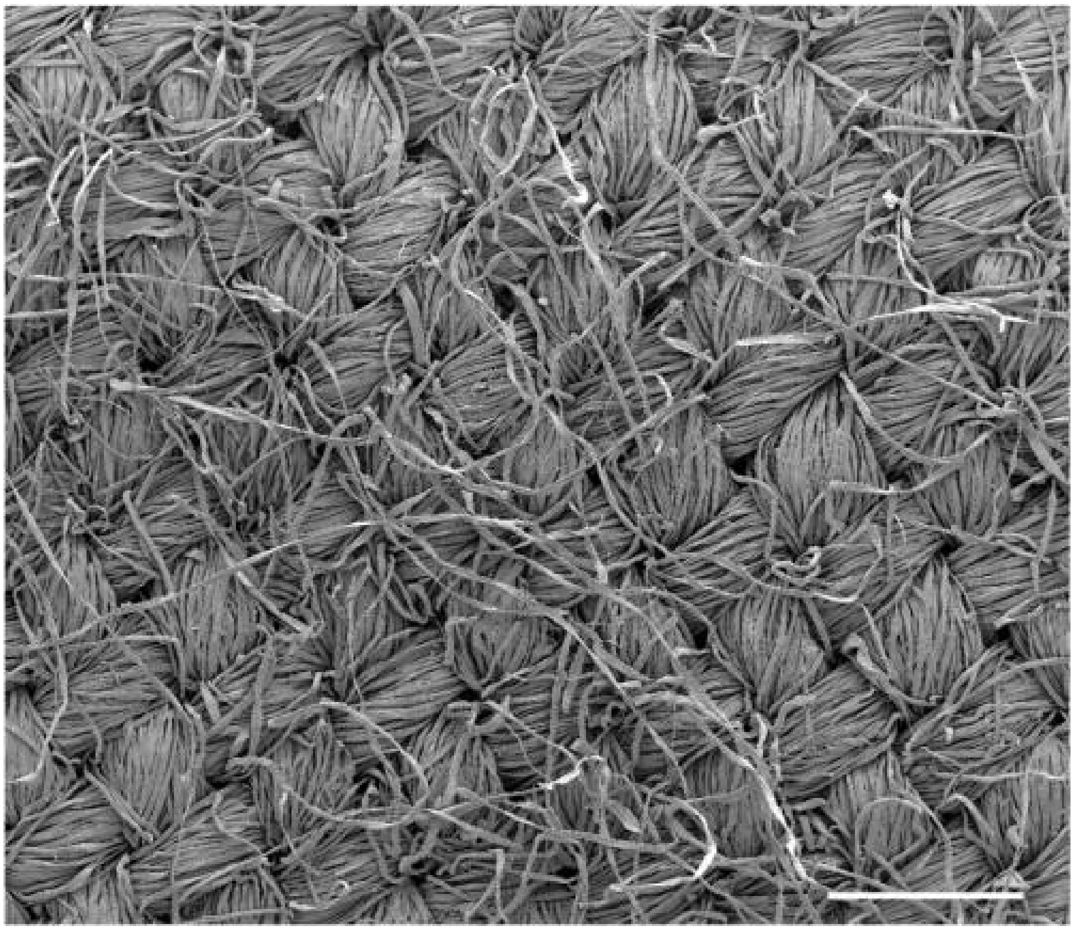
Research shows superior COVID protection from better face masks

March 3 2022



A scanning electron microscope (SEM) image of the surface of our fabric. The fabric has been coated with gold/palladium. Secondary electron images were taken at 8 kV with a 100× magnification. Scale bar = 500 µm. Credit: *Physics of Fluids* (2022). DOI: 10.1063/5.0074229

New research from the University of Surrey and the University of Bristol has shown that FFP2 (filtering facepiece) respirator masks are five times more efficient at filtering particles that carry the COVID-19 virus than cloth masks.

The new research, published in *Physics of Fluids*, details how the Surrey-led research team conducted confocal microscopy to take three dimensional images of woven fabric, the kind of material typically used to make cloth masks. They then used the image to perform Lattice Boltzmann simulations of the air flow through fabric, a common technique used by physicists to analyze fluid dynamics.

The findings from the simulations enabled the team to calculate the filtration efficiency for particles a micrometer (one thousandth of a millimeter) and larger in diameter. For particles with a diameter of 1.5 micrometers—the typical size of COVID-bearing particles—the team estimated woven fabric is only 2.5 to 10% efficient, because most of the air flow is channeled through relatively large gaps between the fabric's yarns. Multiple layers of fabric improve efficiency in a roughly linear fashion, meaning triple-layer cloth masks are up to 30% efficient, but this is still poor in comparison with the material used for FFP2 masks, which is typically more than 90% efficient.

Dr. Richard Sear, from the Department of Physics at the University of Surrey and lead author of the article, said, "It remains important that people are able to make informed choices about what types of face covering to wear. Our research shows that simply switching from using a cloth mask to an approved FFP2 respirator mask significantly improves protection and reduces transmission. The woven fabrics used for cloth masks help disrupt the air flow when people talk, sneeze and breath, reducing the distance traveled by the germs emitted, but they are less effective at filtering when compared to FFP2 masks."

Jake Wilkins, a physics undergraduate when he helped to author the research, said, "I feel lucky to see the results of my work published and to know I'm helping contribute to better knowledge. FFP2 masks are just so much more effective than cloth masks in filtering dangerous particles like COVID-carrying particles. If we wear FFP2 masks to medical appointments, it could help protect NHS staff, the majority of whom are advised to use Type II surgical masks. Those are good, but not as good as FFP2 masks. However, I'd like to see progress towards recyclable masks as the environmental cost of air filtration is high."

More information: Ioatzin Rios de Anda et al, Modeling the filtration efficiency of a woven fabric: The role of multiple lengthscales, *Physics of Fluids* (2022). DOI: 10.1063/5.0074229

Provided by University of Surrey