

## Alfred University professor, graduate students use 3D printing to create personal respirators

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Single-filter respirator mask created using 3D printing technology.

ALFRED, NY – Not long ago, Alfred University’s Junjun Ding, assistant professor of Materials Science and Engineering in the Inamori School of Engineering, was leading his graduate students in an exploration of 3-D printing technology, using graphene-oxide as the primary material for constructing electronic nano-materials and devices.

With the onset of the COVID-19 outbreak, Ding and his students have shifted their focus toward the 3-D printing potential for creating personal respirators, devices in high demand but short supply as medical communities scramble to respond to the pandemic.

Ding says he and his students have been using graphene oxide to create an effective air filter – the key to preventing the virus from contacting an individual’s nose and mouth areas. In addition, they have been using 3D printing technology to make respirator frames in which the air filters are fitted.

“For this emergency, I think this technology can play a role,” Ding says. While Alfred University’s labs do not have sufficient resources for practical testing, Ding says the University may engage other larger universities with more extensive testing capacities.

Ding notes there are two main components in a practical respirator: the frame and the filter. At the atomic level, he

adds, the basic filtering material coated with graphene oxide may be negatively charged to repel airborne viruses, which also would hold a negative charge.

For now, his students are experimenting with using graphene oxide to create a coated layer of filtering material that resides within two additional layers. The central layer is the key filtering material for particles as small as a virus.

Three-layer filters are common in respirator masks. “If you cut open a facemask,” Ding says, “you’ll find the three layers. The outer two layers are just cloth. We just use the middle layer as the substrate.”

Ding joined the Inamori School of Engineering faculty in 2017 after receiving his Ph.D. from the Stevens Institute of Technology, in Hoboken, NJ. He grew up in Anqing, China, and studied at University of Science and Technology of China before moving to the U.S. for his doctoral studies in mechanical engineering.