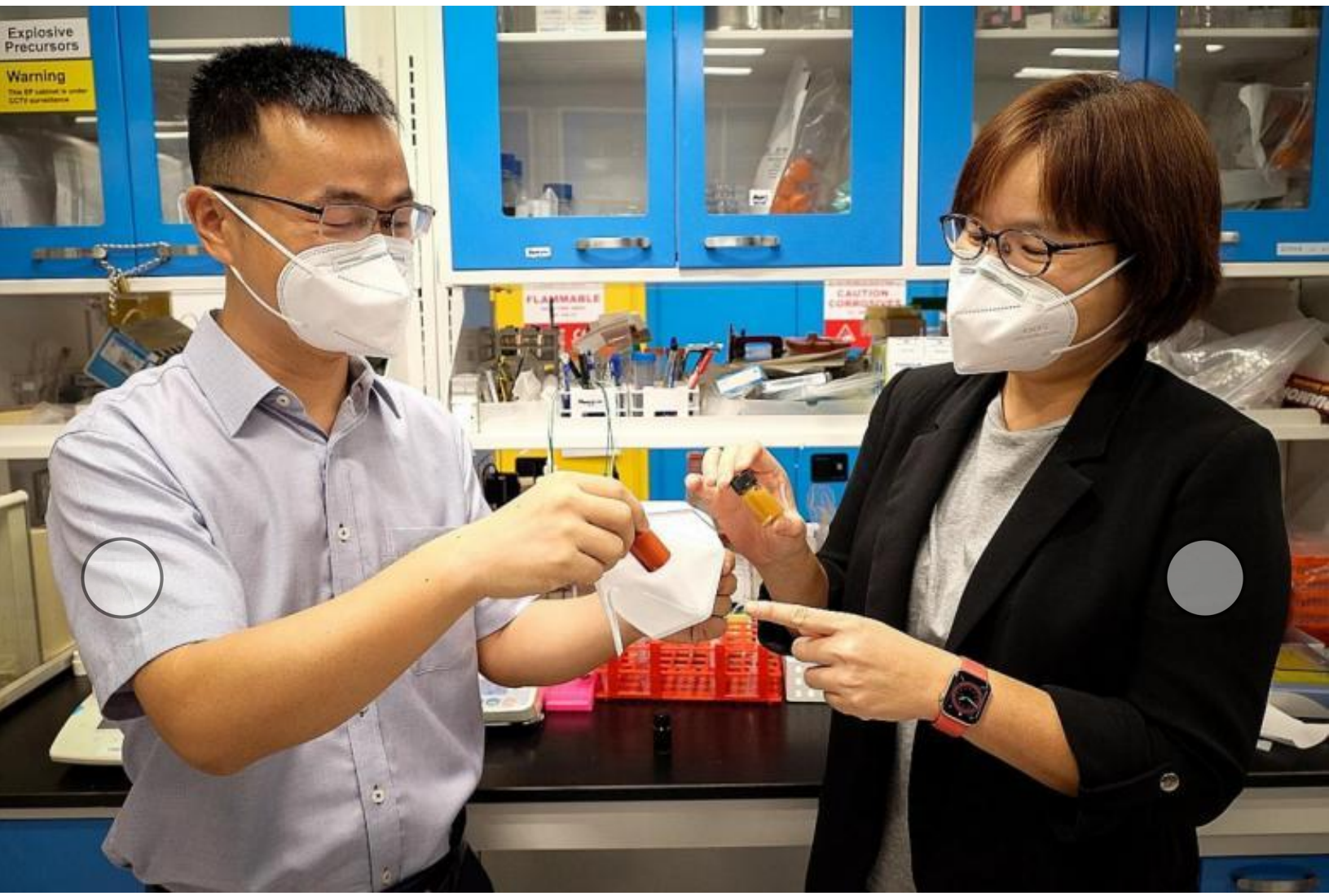
SINGAPORE

NTU team's reusable mask can filter 99.9% of bacteria, viruses



Associate Professor Liu Zheng (left) and Professor Lam Yeng Ming with the new mask and bottles of copper oxide nanoparticles - the mask is coated with a layer of copper oxide that can damage the DNA of key cell structures in bacteria. PHOTOS: NTU

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Scientists from Nanyang Technological University (NTU) have developed a reusable mask that is able to kill bacteria droplets within 45 seconds and filter 99.9 per cent of bacteria, viruses and haze particles - better than the medical-grade N95 masks used in hospitals.

N95 masks are able to prevent around 95 per cent of aerosolised droplets and particulate matter of around 0.3 micron in size from entering them.

The filter of the NTU-developed mask is coated with a layer of copper oxide nanoparticles, which damage the DNA of important cell structures in bacteria, causing them to die, said Professor Lam Yeng Ming, chair of NTU's School of Materials Science and Engineering, who developed the antimicrobial coating.

To ensure these microbes remain trapped on the filter, Associate Professor Liu Zheng managed to integrate electrostatic materials to the fabric filter made from polypropylene, so that particles, including bacteria and viruses, with a negative or positive charge can be attracted to it.

EXPERIMENTS

To test the efficacy of this, experiments were conducted in collaboration with scientists from the National University of Singapore, where multidrug-resistant bacteria that were sprayed in droplet form onto the fabric surface were killed in 45 seconds.

Asked if the copper oxide nanoparticles can also kill viruses such as the Sars-CoV-2 that causes Covid-19, the team said various peer-reviewed studies have shown that these coatings can reduce surface transmission of the virus, though they had not experimented with it.

For instance, in a study conducted by The University of Hong Kong and Virginia Tech in the United States, door handles coated with a layer of copper oxide material had shown that the infectivity of the coronavirus was reduced by 99.8 per cent in 30 minutes and 99.9 per cent in an hour.

The NTU team tested its nanoparticle coating by washing it in soap water at 45 deg C for 120 washing cycles and found there was almost no copper loss, hence posing little risk of toxicity to humans.

The nanoparticles are also bonded to the fibres within the mask, so there is no contact with human skin.

With these properties integrated into the mask prototype, Prof Lam said the mask is well equipped to protect one from Covid-19.

However, more tests have to be done to determine the maximum reusability of the mask before its antimicrobial and filtration efficiencies are affected.

The antimicrobial coating has a patent filed through NTU's enterprise and innovation company, NTUitive, and Prof Lam's team is already working with local company Sportiv Tech Lab for its reusable face mask.

The team is hoping to work with local industry partners who are keen to license and scale up the production of its mask.