

Scientists here develop smart mask to monitor vital signs

System can be attached to any face mask and help front liners check on patients remotely

Timothy Goh

Local scientists have developed an integrated monitoring system that can be easily attached to any face mask in order to monitor the wearer for health indicators associated with Covid-19.

Sensors pick up skin temperature, blood oxygen saturation, blood pressure and heart rate – all of which are parameters associated with coronaviruses.

Professor Loh Xian Jun, who is one of the scientists behind the invention, told The Straits Times yesterday that the inspiration for the system came around the circuit breaker period.

“We saw that when Covid-19 patients were in isolation wards, the

front-line workers had to go in and take temperature readings and blood oxygen saturation every 30 minutes or so to monitor their vital signs,” said Prof Loh, who is an executive director at the Agency for Science, Technology and Research’s (A*Star) Institute of Materials Research and Engineering.

“This also coincided with the time when we saw findings that the virus was present in various parts of the hospitals... So we were wondering if there was a way to help our front-line workers and to reduce the risk that they face,” he added.

Prof Loh said nurses also have to drag big and bulky equipment from room to room while carrying out such monitoring, which is not only inconvenient but also increases the risk of spreading the virus.

In hospitals, such smart masks could be given to Covid-19 patients, allowing staff to monitor their vital signs remotely, reducing the risk of infection for front-line workers.

Together with Professor Chen Xiaodong from the School of Materials Science and Engineering at the Nanyang Technological University, and a team of fellow scientists, Prof Loh produced a series of sensors.

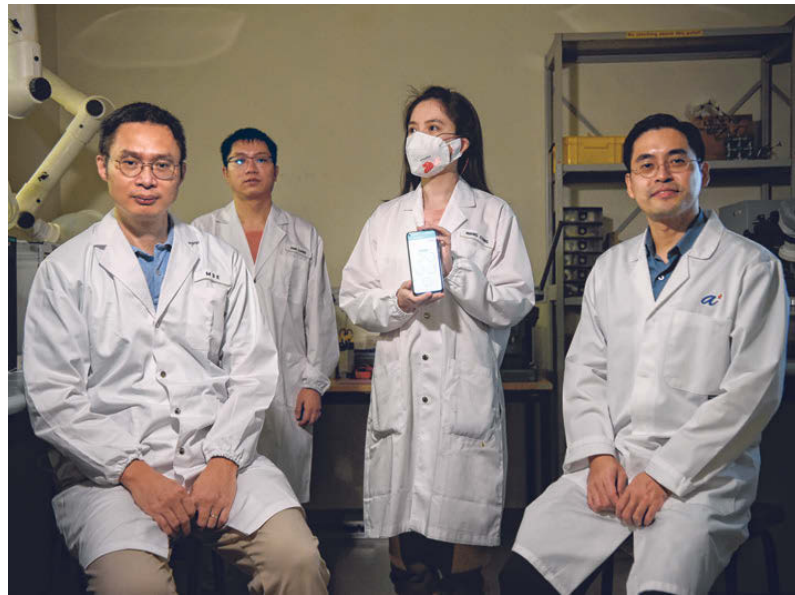
But placing the thumb-size sensors on the inside of a mask would be uncomfortable for the wearer, so the team integrated them into an artificial skin-like substrate.

Prof Chen said a later version of the system, which integrates all three sensors into one chip, is currently being tested.

They also added a Bluetooth device, allowing real-time data to be transmitted to a smartphone.

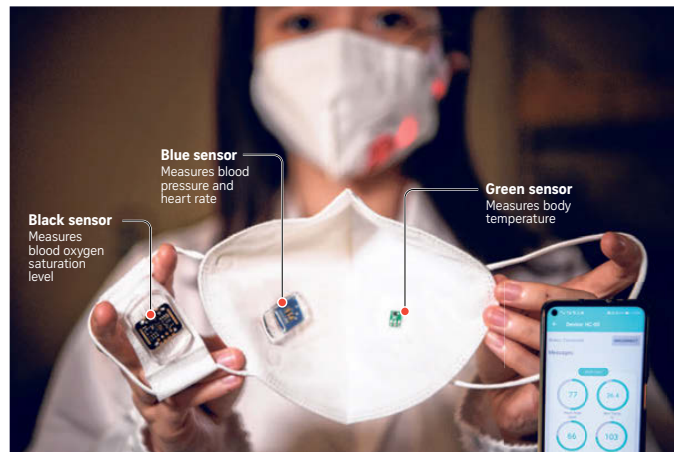
The substrate is made from a polymer material similar to the one used in super balls, a toy popular with children for its ability to bounce high.

By integrating the chip into the elastic material, it allows the wearer to feel more comfortable but also in-



The team behind the smart mask system – (from far left) Professor Chen Xiaodong, research fellows Liang Pan and Wang Cong, and Professor Loh Xian Jun. Ms Wang is wearing the smart mask, which allows the wearer’s real-time health data to be transmitted to a smartphone via Bluetooth. ST PHOTO: MARK CHEONG

A Bluetooth-enabled mask



The sensors can feed data to a smartphone using Bluetooth, allowing the wearer’s vital signs to be monitored easily. They are covered in a skin-like substrate to make them more durable, increase sensitivity, and make it more comfortable for the wearer.

ST PHOTOS: MARK CHEONG STRAITS TIMES GRAPHICS

creases the sensitivity of the chip.

The extremely flexible and durable material, which is water-resistant, also protects the chip, allowing it to be reused multiple times, said Prof Chen.

Prof Loh added that the device can

be sewn into the cheek area of a regular reusable or disposable face mask. It could theoretically be washed and reused along with the mask.

The team said the Bluetooth function allows their system to not only be useful to individuals who are

monitoring their own health, but also potentially those overseeing the health of populations.

For instance, Prof Loh said, integrating the system into the face masks worn by migrant workers could complement existing

telemedicine efforts to monitor health trends in dormitories.

The researchers are planning to test their system in clinical trials by the end of this month, with hopes to bring it to the market in future.

Prof Chen said the chips and system are relatively simple to produce, and that all the materials needed to make them can be sourced locally.

He added that under the current lab-scale production levels, it costs about \$50 to make one of the systems – but if production is ramped up on a mass scale, it could cost less than \$20.

Prof Loh said that currently, the priority is to distribute the monitoring system when it is ready to front-line workers and patients in hospitals, and for it to be used in dormitories, before it is made available to the public.

Beyond Covid-19, the researchers hope to use the monitoring system for healthy people as well in order to collect data to predict health trends.

They are also working on adding another sensor to the mask to detect and analyse various particles in saliva droplets.

Prof Loh said: “My wish is that this mask will contribute a little to help the front-line workers lower their risk of exposure. We also hope to demonstrate that our research will be useful to Singapore and help in some way with this pandemic.”

Prof Chen added: “We hope that this research can help locals, and mitigate the impact of the pandemic. I also hope it can help lower the risk posed by Covid-19 to the community here.”

timogh@sph.com.sg

KEEPING FRONT-LINE WORKERS SAFE

We saw that when Covid-19 patients were in isolation wards, the front-line workers had to go in and take temperature readings and blood oxygen saturation every 30 minutes or so to monitor their vital signs... This also coincided with the time when we saw findings that the virus was present in various parts of the hospitals... So we were wondering if there was a way to help our front-line workers and to reduce the risk that they face.



PROFESSOR LOH XIAN JUN, who is one of the scientists behind the invention. He is an executive director at the Agency for Science, Technology and Research’s (A*Star) Institute of Materials Research and Engineering.