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NUS tech coup means your clothes could detect tumours

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SINGAPORE - Portable handheld sensors for detecting explosives, wearable sensors that can detect chemical agents, or non-invasive imaging techniques that could detect tiny tumours could be a reality, thanks to a breakthrough in terahertz (THz) technology achieved by researchers from the National University of Singapore (NUS).

The technology — which allows THz waves to pass through non-conducting materials such as clothes, paper, wood and brick without weakening their performance — has already been widely applied in areas such as cancer diagnosis, the detection of drugs and explosives, coating analysis and the quality control of integrated circuit chips.

However, the current sources for generating THz waves — the area between microwaves and infrared light waves in the electromagnetic spectrum — are large, multi-component systems that are heavy, expensive, and hard to operate and maintain. These include bulky, high-powered lasers or device-fabrication processes.

The NUS team, led by Associate Professor Yang Hyunsoo and Dr Wu Yang from the Department of Electrical and Computer Engineering at the NUS Faculty of Engineering and NUS Nanoscience and Nanotechnology institute, has now developed high-performance and low-power-driven THz emitters that could be produced at a low cost.

The project was carried out in collaboration with researchers from the Institute of Materials Research and Engineering at Singapore's Agency for Science, Technology and Research, and China's Tongji University.

The researchers used a 12-nanometre-thin metallic film material, instead of the usual 500-micrometre-thick electro-optical crystal emitter, to develop THz wave emitters that can be powered by a lower-power laser, yet produce a higher power output.

They also came up with a new technique of producing the emitters by using a large wafer-scale film that can be deposited, and subsequently diced, for use in many ready-to-use devices.

Their tests showed that the performance of the device which used such emitters was not compromised, even when employed on flexible surfaces, which means that the technology can also be incorporated into wearable devices.

The researchers say their invention can also help to miniaturise bulky THz systems, which are used in processes such as the detection of dangerous chemicals and explosives, and in providing affordable and high-performance THz screening devices that can improve disease diagnosis.

Associate Professor Yang said, "Our invention is a big step forward in THz technology, and we believe that this will greatly accelerate its application in various fields."

The NUS team, which has filed a patent for its invention, hopes to work with industry partners to explore a number of other applications for the technology.

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