Ultraviolet light sensor for wearable devices

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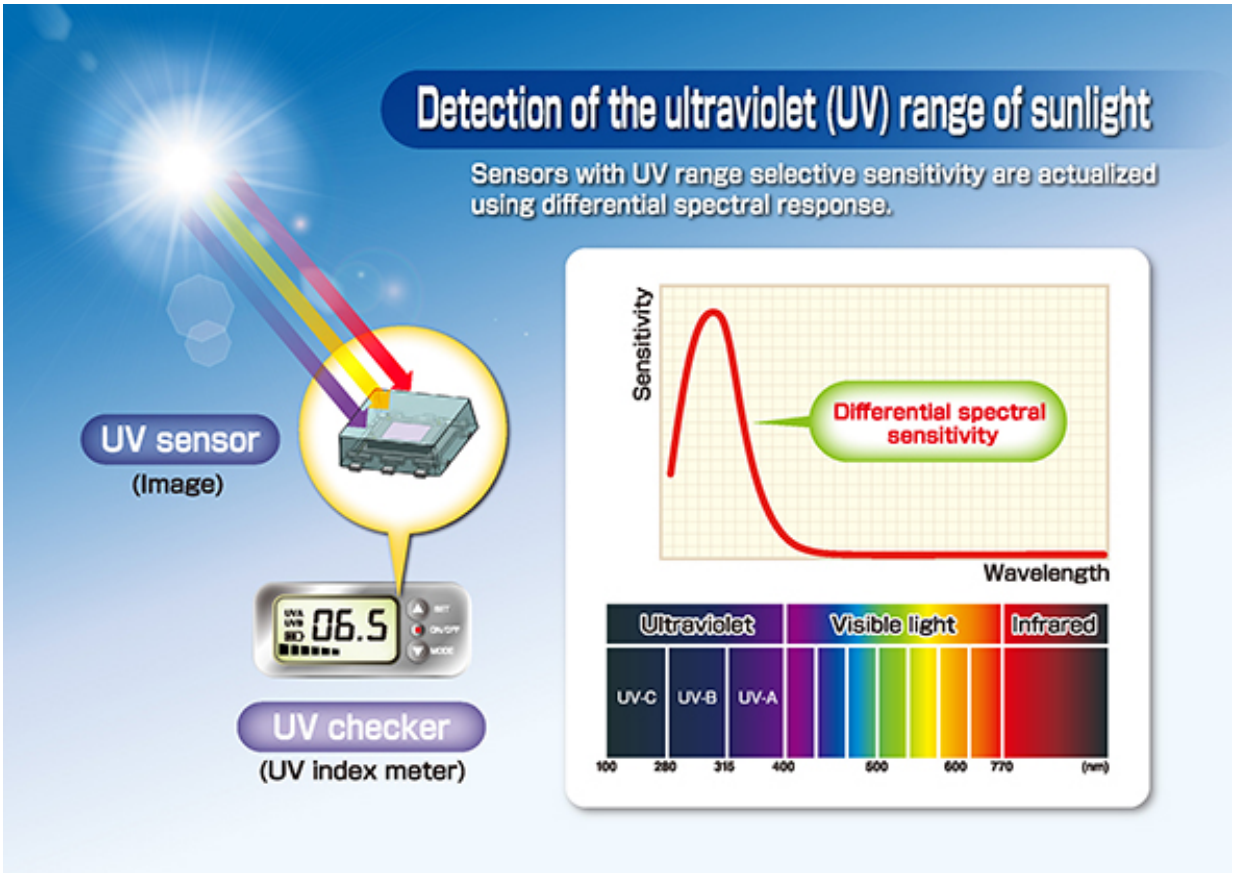

The new UV light sensor technology uses only silicon semiconductors to selectively detect and measure the light intensity of UV-A and UV-B light wavebands. Credit: Tohoku University

Mass production technology for silicon based ultraviolet (UV) light sensors, suitable for smartphones and wearable devices in the Internet of

Things (IoT) era, has been jointly developed by a research team at Tohoku University and SII Semiconductor Corporation, a semiconductor manufacturer at Seiko Instruments Group.

In recent years, there's been growing interest within the healthcare community in the prevention of sunburns and skin blemishes. As such, easy measurement of UV light through the use of a smartphone or a wearable device could be of great benefit to healthcare and aesthetic medicine. In fact, the need to measure invisible UV light is also increasing in industrial fields, where equipment such as UV curing machines and printers using UV curable ink are being used more frequently now than ever before.

The new UV light sensor technology, developed by the research team led by Professor Shigetoshi Sugawa and Associate Professor Rihito Kuroda at Tohoku University's Graduate School of Engineering, uses only silicon semiconductors to selectively detect and measure the light intensity of UV-A (315~400nm) and UV-B (280~315nm) light wavebands. These are the wavebands to which sunburns and skin blemishes are attributed. Versatile silicon semiconductor sensors are more adaptive to integrations with circuits and add more functions than compound semiconductor UV sensors.

Conventionally, silicon photodiode UV light sensors employ optical filters that cut off undesired visible light wavebands. By utilizing the differential spectral response of silicon photodiodes with high and low UV light sensitivities, the researchers were able to develop a sensor with UV range selective sensing capabilities without employing an optical filter.

The optical filter-less structure obtains a higher sensitivity by preventing a decrease of incident UV light intensity to the sensor.

Sugawa and Kuroda had previously developed a silicon photodiode technology providing 190~1100nm wide spectral response and high performance resistance against UV light irradiation. They did this through the JST SENTAN-project which ran from 2011 to 2013.

That silicon photodiode technology has now been applied to the mass production technology of the UV light sensors, which utilizes the newly introduced differential spectral response method. The developed UV light sensors are then loaded to small transparent resin packages with little constraints for assembly, which makes them suitable for use in smartphones and wearable devices. It is expected that anyone can detect and measure UV light using this newly developed technology.

SII Semiconductor Corporation plans to start shipments of the products in spring 2018.

Provided by Tohoku University