

New material detects levels of UV radiation and monitors radiation dose

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Researchers at the University of Turku, Finland, have developed a synthetic material, SensoGlow, that detects the quantity and quality of ultraviolet radiation from the sun or other sources. This material makes it possible to produce an affordable, versatile, and long-lasting UV radiation detector which can be used to monitor the UV radiation dose with a mobile app, for example.

UV [radiation](#) causes many skin and eye conditions, including cancer. Therefore, it is essential to have a simple method for detecting the quantity and quality of UV radiation from, for example, the sun. Mika Lastusaari, Docent in Inorganic Chemistry at the University of Turku, says, "This is currently achieved by using mainly [organic molecules](#) that change colour under UV radiation. The downside of using these molecules, however, is their poor durability which is due to the fact that the colour changes involve reorganisation of the molecular structure. Organic molecules are thus not very long-lasting for this purpose."

SensoGlow is a [synthetic material](#) based on natural hackmanite that can change colour according to the quantity and quality of UV radiation. This material can be tuned to respond to UVA, UVB or UVC radiation levels, as well as the UV index of the sun.

"The colour change of the SensoGlow material isn't based on structural change but on the electron storage in the material which makes it more durable than organic alternatives. Since the colour change is based on electron storage, the process is reversible. When the material is removed

from UV radiation, electrons return to their ground state, and the colour of the material returns to normal," says Isabella Norrbo, who is doing her doctoral dissertation in the research group.

Because of these properties, the material can be used multiple times. In addition, the production of SensoGlow material is very inexpensive, as it is composed of common elements.

"We believe that it is possible to produce an affordable, versatile, and long-lasting UV radiation detector that could function in everyday use to monitor your UV radiation dose. This monitoring could be done using a [mobile app](#), for example," says Lastusaari.

The colour intensity of the SensoGlow material correlates with the dose of radiation. The material could, for example, be used as a sticker attached to a watch. The amount of radiation could be quantified by taking a picture of the sticker with a mobile phone, and a mobile app would indicate the current value of the UV index.

In addition to conducting experimental research, the researchers examined the colour change through computational methods in a collaborative research that was carried out by the University of Lyon in France. The computational results confirmed the experimental findings. "Through these results, we were able to gain more information on the mechanism related to the colour change, and on colour reversion. In the experimental research on the mechanism of the [colour](#) change, we had help from the Department of Physics of the University of Turku, Solar Simulator Finland Ltd., and Uppsala University," says Lastusaari.

More information: Isabella Norrbo et al, Solar UV index and UV dose determination with photochromic hackmanites: from the assessment of the fundamental properties to the device, *Materials Horizons* (2018). [DOI: 10.1039/C8MH00308D](https://doi.org/10.1039/C8MH00308D)

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