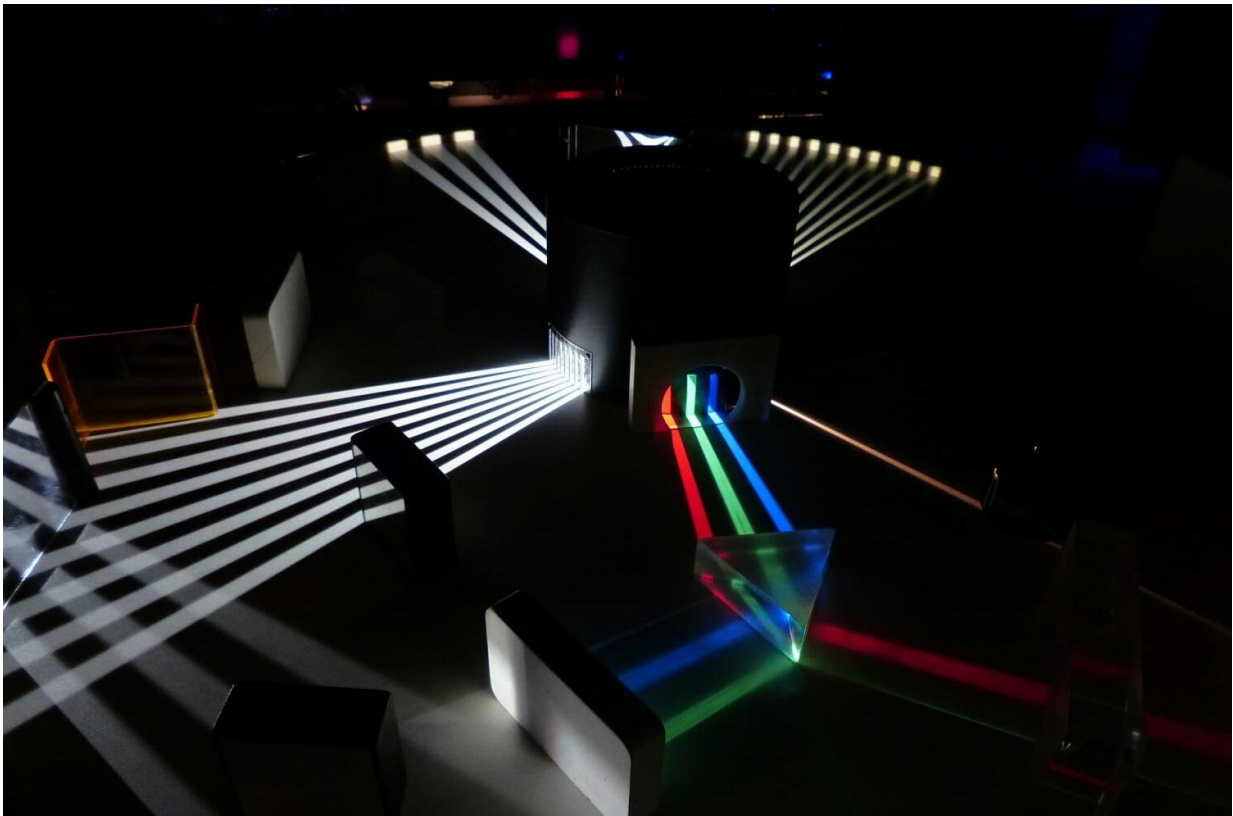


Researchers discover novel optical sensing technology

April 17 2020



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Researchers at Northumbria University have developed a new optical sensing technology which can light up areas of an object or material by creating microscopic wrinkles and folds within its surface.

Inspired by the way the outer layer of plants and animals can change color in nature, researchers have combined their expertise in physics and chemistry to create the new technology. It could have a variety of practical applications, including within flexible wearable devices, electronics, and in 3-D printing. The research was carried out by Dr. Ben Bin Xu, Dr. Yifan Li and Dr. Valery Kozhevnikov, from Northumbria University, supported by EPSRC and the Royal Society Kan Tong Po International Fellowship 2019.

There are two specific elements to the research. The first was the creation of a thin 'film' or material which, when stimulated with a mechanical or electronic signal, results in microscopic folds being created on its [surface](#), usually too small to be seen with the naked eye. The second element was the creation of a chemical 'paint' which is applied to the material. When the folds are created in the surface, the resulting change in [oxygen levels](#) within the 'paint' leads to a chemical reaction. This creates a luminescent effect, making the surface of the material appear to 'light up' in the area where the fold has occurred.

Dr. Xu, an associate professor in Mechanical Engineering who led the project said: "Wrinkles and folds are usually unwanted in engineering terms. Similarly, an oxygen quenching effect is not popular in fluorescence science. However, through micro-engineering, magic happened, and two unwanted phenomena were turned into a responsive and programmable 'fold to glitter' function."

When subjected to mechanical stimuli, elastomeric materials such as that created by the Northumbria University researchers can undergo surface changes, such as wrinkles and cracks. This can be used to create switchable optical features and structural color with dynamic luminescent patterns. The phenomenon of elastic wrinkling and folding exists widely in nature and there has been much research by academics to understand the mathematical and physical science behind these

changes and to explore how this could be used for innovative engineering solutions.

The [research paper](#) setting out the findings has been published in scientific journal *Nature Communications* and it is hoped this latest research will create new opportunities for designing the next generation of flexible/wearable devices.

More information: Cong Wang et al. A flexible topo-optical sensing technology with ultra-high contrast, *Nature Communications* (2020).
[DOI: 10.1038/s41467-020-15288-8](https://doi.org/10.1038/s41467-020-15288-8)

Provided by Engineering and Physical Sciences Research Council

Citation: Researchers discover novel optical sensing technology (2020, April 17) retrieved 13 March 2024 from <https://phys.org/news/2020-04-optical-technology.html>

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