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Sustainability monitored through stretchable sensors FREE

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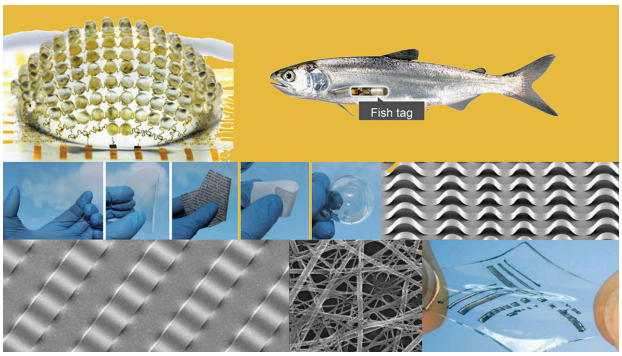
Engineered monitors measure the effects of climate change noninvasively — taking shape to fish, skin, and the environment.



Quantifying anthropogenic pollution and monitoring how it fouls our air and our waterways is critically important for our ability to sustainably manage our natural ecosystems. One emerging helpful technology in recent years have been new sensors that use flexible and stretchable materials to measure the physical environment.

In a review, Yang et al explore recent advances in the development of such stretchable sensors, which can be used to quantitatively monitor environmental cues such as light, temperature, humidity, gas and pH.

Two main strategies have been used for designing such sensors: engineering non-stretchable materials into moldable geometries or using intrinsically stretchable materials. Each approach has its own advantages. Geometry-engineered materials generally have better conductance and electronic performance. Material-enabled sensors, on the other hand, may be more easily embedded onto biological materials like fish scales to survey aquatic environments or human skin for urban environmental monitoring. More than just device structure, the review highlights how material selection and fabrication methods contribute to sensor characteristics, purpose, and performance.

Nanomaterials, because they can easily be assembled and can have intricate patterns, have promise in stretchable environmental sensors by combining the two strategies. For example, carbon nanotubes have high tensile strength and elastic modulus making them a great material for conductors in light, temperature, acidity, and humidity sensors.

Balancing between geometry-engineered and material-enabled materials for optimal and useful environmental readout is non-trivial, and this review covers the achievements and challenges in developing stretchable sensors. Though the materials themselves need to be tested for long-term impact before entering the market and put into the environment, there is a lot of promise that flexible materials will help monitor environmental levels and impact human behavior.

Source: "Stretchable sensors for environmental monitoring," by Yang Yang and Zhiqun Daniel Deng, *Applied Physics Reviews* (2019). The article can be accessed at https://doi.org/10.1063/1.5085013.