Multispectral Materials Inspired By Squid Iridophore Refractive Index Profiles

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OTHER INFORMATION

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Materials & Chemicals**
  - Composites
  - Textiles

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BRIEF DESCRIPTION

A bioinspired optical material system that enables vibrant, tunable, and durable color modulation across visible and infrared spectrums

FULL DESCRIPTION

This innovative technology involves the fabrication of composite materials capable of precise and reversible color changes. The technology is inspired by the natural design of squid iridophores, which contain Bragg reflectors with sinusoidal refractive index gradients. The material dynamically modulates its optical properties in response to mechanical or chemical stimuli by integrating nanocolumnar Bragg reflectors with gradient refractive index profiles. The fully functional prototype demonstrates high-speed responsiveness, broad spectral tunability from visible to thermal infrared, mechanical durability over thousands of cycles, and scalability compatible with wearable technology.

SUGGESTED USES

- Smart textiles and flexible substrate technologies
- Defense sector applications
- Outdoor and wearable consumer brands
- Electronics and display integration for electronic gadgets

ADVANTAGES

- Combination of vibrant color, tunability, and durability previously unachievable
- Dynamic modulation across visible and infrared spectrum with a single material system
- High-speed responsiveness under 300 milliseconds • Broad spectral control from visible to thermal infrared
- Mechanical resilience and scalability suitable for wearable applications
- Overcomes limitations of traditional discrete multilayer Bragg reflectors

PATENT STATUS

Patent Pending

RELATED MATERIALS

- Georgii Bogdanov et al., Gradient refractive indices enable squid structural color and inspire multispectral materials.Science388,1389-1395(2025).

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