

Manufacturing processes for microstructures producing structural colors

ID# 2020-5063



PennState



TECHNOLOGY READINESS LEVEL

4-7

Seeking

Investment | Licensing | Research

Keywords

- total internal reflection (TIR)
- stimuli-responsive color
- structural color
- iridescence
- colloidal inks, paints, cosmetics

Researchers

Lauren Zarzar, Ph.D.

Assistant Professor

[Online Bio](#)

[Website](#)

Other Researchers

Originating College

Eberly College of Science

Office of Technology Management Contact

Matthew Smith

mds126@psu.edu

814-863-1122

Technology Summary

The inventors modified commercial processes to controllably and economically manufacture two-dimensional and three-dimensional, reproducible patterned surfaces of microstructures to create structural colors at a lower production costs than nanoscale materials. The inventors utilized chemical etching, photolithography, and 3D printing using conventional industrial printing equipment or die molds to create the soft or hard interface master containing the desired plurality of TIR microstructure templates. The interface master can be utilized in a continuous process such as a cast and cure process, and embossing processes for high volume production of the TIR microstructures. Additional post-processing steps may follow, including those involving a second materials – whether solid, liquid or gaseous – to accentuate the TIR, smooth regions of the microstructures and eliminate defects.

Application & Market Utility

Total internal reflection yields intense, vivid optical effects. The tunable microstructure geometries allow for highly customized, non-fading color patterns with wide angular separation and uniquely tailorable optical characteristics. Uses include anti-counterfeiting, product authentication and/or visual enhancement for color-shifting holograms on currencies, lotteries, ATM cards, and product packaging/labels. Flakes dispersed in a carrier, ink or paint may be applied uniformly for cosmetics, automotive paint, road signage and remote sensing.

Next Steps

Limited samples may be available for evaluation.



Invent Penn State is a Commonwealth-wide initiative to spur economic development, job creation, and student career success. Invent Penn State blends entrepreneurship-focused academic programs, business startup training and incubation, funding for commercialization, and university-community collaborations to facilitate the challenging process of turning research discoveries into valuable products and services that can benefit Pennsylvanians and humankind. Learn more at invent.psu.edu.

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.