Docket #: S17-489

Guided mode resonance device for optical beam tapping and imaging without rainbows

Stanford researchers have developed an optical coating that steers infrared and visual light in different paths while suppressing the typical undesired rainbow effect. The coating – a nanopatterned dielectric waveguide coated with an absorbing layer - extracts light of select wavelengths, well-defined polarization state, and/or angle of incidence. The extracted light can be efficiently redirected, making a compact, transparent eye tracker compatible with head-mounted/heads-up displays. The coating is ideal for augmented and virtual reality systems, displays, goggles, imaging, and optical switching applications.

Stage of Research

Researchers demonstrated ultra-thin, rainbow-free, eye tracking, optical coating device based on guided mode resonance that exhibits near-unity transmission. The tested 200-nm-thick Si_3N_4 slab waveguide was sandwiched between a quartz substrate and a 100-nm-thick SiO_2 capping layer designed for high transmission (>90%) over the whole visible spectrum. Prototype glasses are under development.

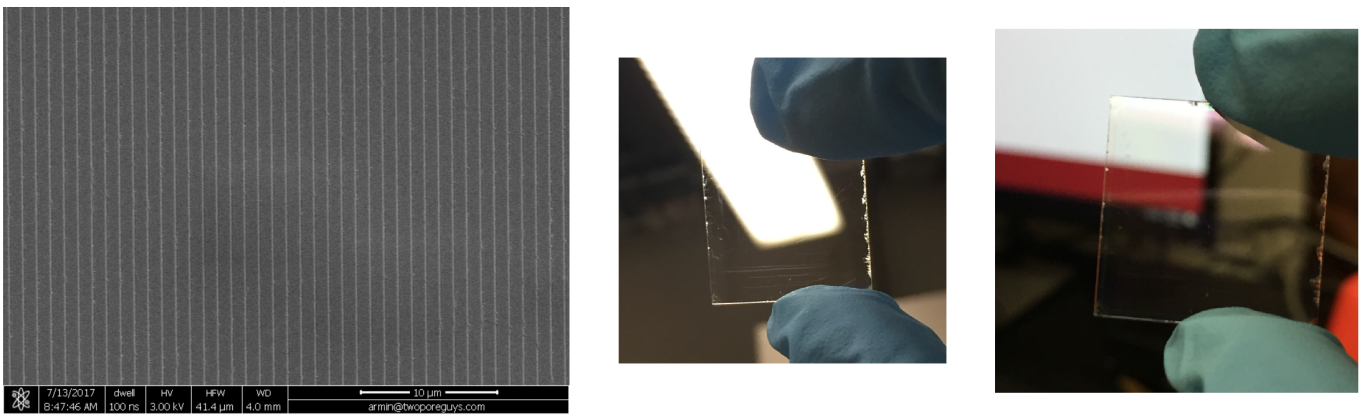


Figure 1. Fabricated device for optical beam tapping and imaging without rainbows

Applications

- Eye tracking and imaging
- Augmented and virtual reality systems
- Displays
- Goggles and high-end glasses
- Optical communication
- Imaging, spectroscopy, and microscopy

Advantages

- Ultra-compact, transparent, and non-obtrusive
- Suppresses rainbows while redirecting light

Publications

- Song, Jung-Hwan, Soo Jin Kim, Jorik van de Groep, and Mark L. Brongersma. "Rainbow-free guided-mode resonance metasurfaces for optical eye-tracking with near-unity transmission (Conference Presentation)," In *High Contrast Metastructures VIII*, vol. 10928, p. 1092810. International Society for Optics and Photonics, 2019. https://doi.org/10.1117/12.2507273

Patents

- Published Application: 20200049997
- Issued: 10,890,772 (USA)

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