

LightTrans' Talks at SPIE Photonics West 2020

Modeling of High Contrast Metasurfaces and Their Performance
 in General Optical System Using Fast Physical Optics

SPIE OPTO – Session 6: Metasurface/Metastructure: Design and Topological Concept

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Metasurfaces, especially those made from high refractive index materials, have gain notable success in recent years in different applications. Devices such as meta-gratings/lenses are usually composed of properly designed unit cells (building blocks) with specific phase or polarization manipulation functions. Typical design of such meta-devices usually consists two steps: 1) rigorous analysis of the unit cells; 2) spatial arrangement of unit cells with varying structural parameters. For the intuitive correspondence relation between optical functionality and the structural parameters, it often assumes that the coupling between adjacent unit cells is negligible. But this is not ensured and must be verified. On the other hand, to apply rigorous analysis of the whole device would require too high computational power. We will present a physical-optics-based approach to deal with the modeling of the whole metasurfaces, with a locally extended rigorous analysis of several unit cells so to include possible coupling effects, while the computational efficiency remains high. Examples on meta-gratings and lenses will be presented. Besides single-component modeling, we will also demonstrate the inclusion of metasurface devices in the modeling of a complete optical system and to evaluate their performance.

