

“Nanophotonic Metasurfaces for UV Molecular Spectroscopy and Bio-Imaging”

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【Abstract】

Metasurfaces are artificial photonic devices composed of subwavelength nanoparticles. By precisely tailoring their geometric parameters, these devices can be effectively designed for various functionalities. Their ultracompact size and unique properties hold great potential for advancements in many fields. In this talk, I will focus on the development and applications of metasurfaces for deep ultraviolet (DUV) molecular spectroscopy and bioimaging. First, I will showcase plasmonic metasurfaces employing silicon (Si) nanostructures tailored for DUV spectroscopy. Silicon exhibits plasmonic resonance due to the strong interband transitions in the DUV range. Through careful design adjustments, our metasurface achieves strong field enhancement at approximately 260 nm. We investigate the potential applications of the reported Si metasurfaces for surface-enhanced spectroscopy by leveraging their unique properties. This study expands the range of materials employed in DUV nanophotonics, unlocking opportunities in fields such as biomedical analysis and nonlinear optics. Next, I will discuss the potential use of metasurface lenses (metalenses) for bioimaging. Lightsheet fluorescence microscopy (LSFM) offers a unique advantage by providing optical sectioning of biospecimens with a large field of view and low photodamage. However, the bulky system setup hinders relevant advancements. To address this, we developed an ultrathin metalens consisting of gallium nitride (GaN) nanopillars. The metalens is only 700-nm-thick and can provide uniform lightsheet illumination for biospecimens such as *C. elegans*. This miniaturized LSFM system enables observing the full reproductive and developmental processes inside the biospecimens, opening exciting possibilities for future drug and disease research.

使用言語 : 英語 (English)

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