All-Dielectric Metasurfaces for Sensing

Keywords: metasurfaces, photonic crystals, BIC, biosensors

National Institute for Materials Science

Back-ground

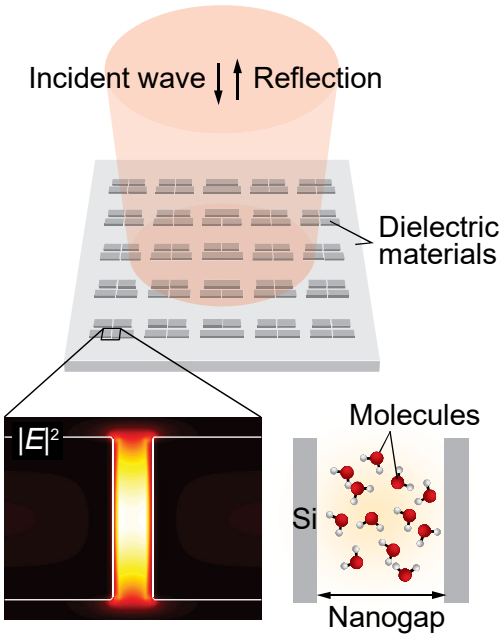
High refractive index dielectric metasurfaces hold great promise for highly sensitive sensing platforms of biomolecules because of the diverse tunability of their optical properties, small absorption losses, and availability of CMOS-compatible fabrication.

Aim

Strong light-matter interactions capable of demonstrating high-performance sensing and spectroscopy is demonstrated. A collective response at a singularity, called bound state in the continuum, in dielectric arrays offers enhanced refractometric sensitivity and vibrational coupling of molecules, which is difficult in metallic arrays.

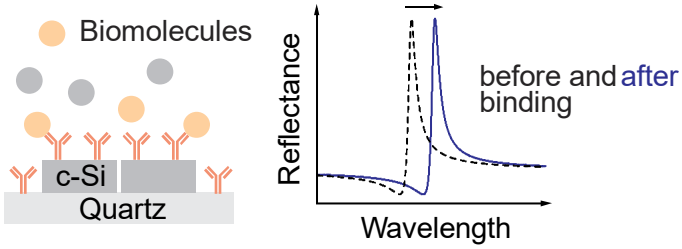
Advanced Research Topics

■ All-dielectric metasurfaces



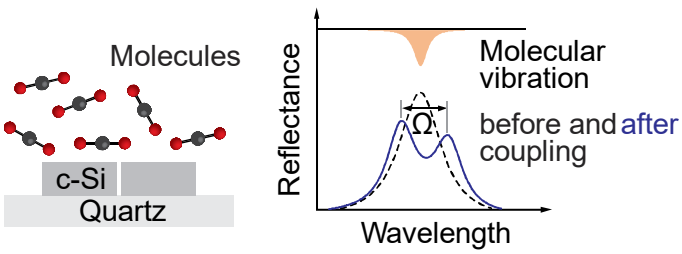
Strong electromagnetic field confinement + Collective response in a dielectric array

■ Refractometric sensing



✓ High *Q* and large interplay with external medium

■ Vibrational spectroscopy



✓ Surface enhanced infrared spectroscopy utilizing resonance enhancement of the electric fields

Summary

- All-dielectric metasurfaces at quasi-BICs offer design flexibility of controlling the resonance wavelength, linewidth, and amplitude.
- Refractometric sensors and vibrational coupling under tailored coupling conditions are realized.

Research outcome

- Highly sensitive sensing/spectroscopy platforms and their design strategies
- Integrated microfluidic chips for diagnostics
- Playground for molecular reactions at the nanoscale in dielectric materials

Keisuke Watanabe, International Center for Young Scientists
E-mail : WATANABE.keisuke●nims.go.jp
URL : https://researchmap.jp/90945362

Please note that ●in E-mail address is just for anti-spam countermeasures.