



Faculty of
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Highly Sensitive Optical Refractive Index Sensor with Meta-Surface

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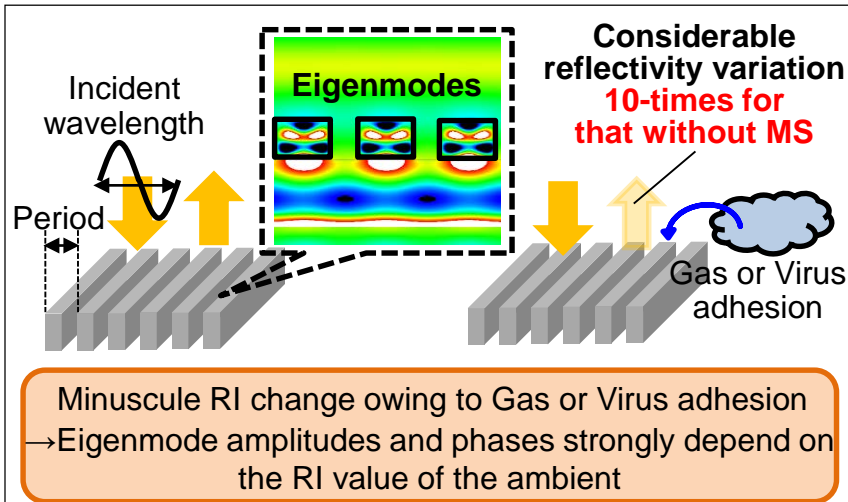


Fig.1 Operation principle of RI sensing with meta-surface

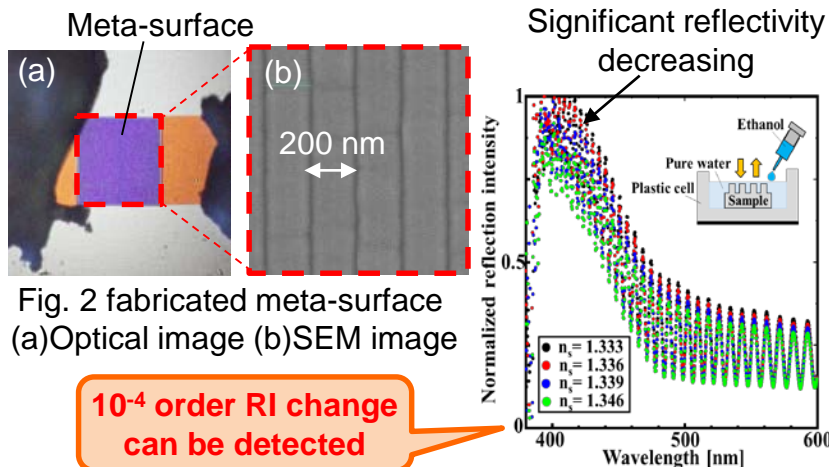


Fig. 2 fabricated meta-surface
(a)Optical image (b)SEM image

Fig. 3 Dependence of reflectivity on the ambient RI value n_s

Content:

Optical refractive index (RI) sensors is highly desirable for many applications, such as gas-detection and bio-sensing. For these applications, high sensitivity and compactness are required.

Highly sensitive compact RI sensor was demonstrated with periodic meta-surface (MS), whose dimension is smaller than the incident wavelength (Fig.1). The amplitude and phase of the optical eigenmodes resulting from the subwavelength periodicity of the MS considerably depend on the ambient RI. As a result, highly sensitive RI sensing can be realized.

We fabricated the MS on GaN substrate (Fig. 2). The Blue-violet light is strongly reflected owing to the structure. Utilizing the eigenmodes in the MS, 10^{-4} order RI can be experimentally detected with very compact and simple optical system, as shown in Fig. 3. Our sensor is very suitable for the integrated devices for gas- and bio-sensing due to its high sensitivity and compactness

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