

# Metamaterial structure and its refractive index sensor

## Compact and high sensitivity (599nm/RIU) refractive index sensor

### Summary

Metamaterials are artificial structures which produce electromagnetic responses smaller than the electromagnetic waves wavelength that cannot be produced by ordinary materials. There are two types of refractive index sensor that uses surface plasmon: 1/Refractive index sensor using plasmons propagating on a glass prism where a thin gold film is deposited. It enables precise measurements but the apparatus is complicated, large, and expensive. 2/Refractive index sensor using localized surface plasmons of gold colloids. The sensor is low price, compact size and simple to measure but its detection accuracy is extremely poor compared to the previous one (refractive index sensitivity: 65 nm/RIU).

This invention is about a refractive index sensor which enables low price, compact and highly sensitive measurement (599 nm/RIU) using metamaterials.

### Effect

High sensitivity (refractive index sensitivity: 599 nm/RIU)  
Able to measure refractive index with a simple configuration and high precision without the need for a polarized light source

### Application

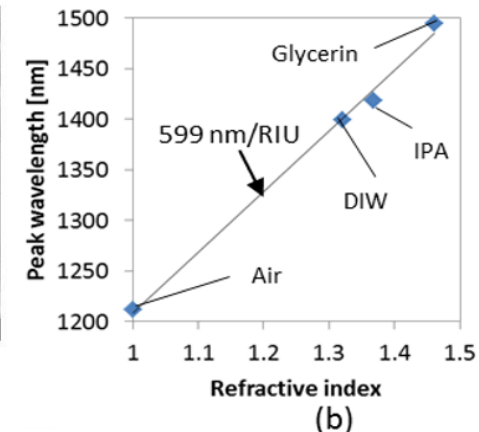
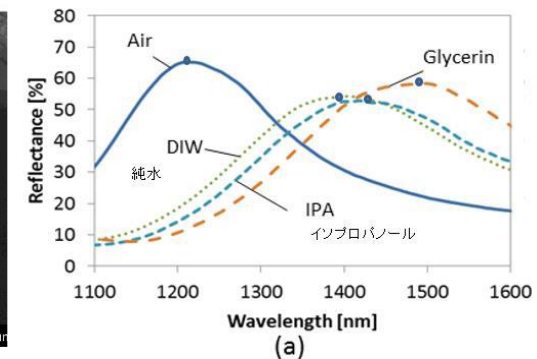
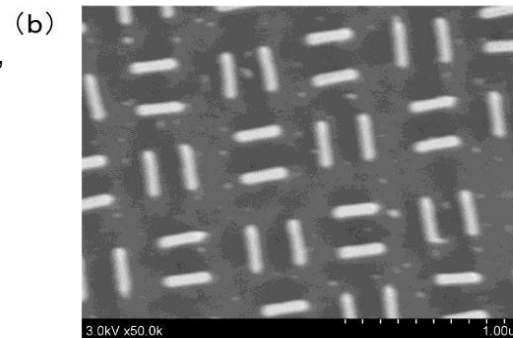
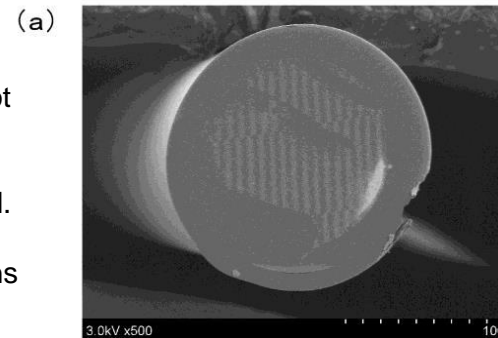
- Quality control of beverages/foodstuffs, chemicals, petrochemicals, paper & pulp, textiles, etc.
- Label-free and non-invasive detection of viruses, proteins, etc.
- Safe gas sensing without using electricity
- Skin health (for beauty)

### Patent Data Sheet

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【Figure】(a) Electron micrograph showing a metamaterial structure on the tip surface of an optical fiber  
(b) Enlarged electron micrograph of the center of the above tip surface

- a) Graph showing the wavelength dependence of the reflection spectrum  
b) Graph showing the dependence of the peak wavelength on the refractive index of the produced refractive index sensor

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