

## Abstract

In this paper, we make a surface plasmon resonance based plastic optical fiber sensor and study the bending effect and the structure of the cascade sensing area to improve sensor's performance. In order to increase the sensitivity of sensor, three parameters were changed including optical fiber diameter, bending and sensing area. In experiment, we use glycerol solution to measure the SPR transmittance for cascade sensor and find the variation of transmittance could be superimposed, which performed double amount. In the bending experiment, we found the optimum bending diameter was 6 cm, which had best sensitivity and increased 374 nm/RIU. The optimized sensor structure, which is cascade and bending, was applied for glucose solution measurement. It results in sensitivity increasing 172 nm/RIU and variation of transmittance is 1.43 times than that of the original. Finally, for energy intensity measurement, our proposed SPR sensor was applied to respiration monitoring. The experimental results show better performance than that with bare plastic optical fiber by 0.69 dBm. Not only measuring the breathing frequency, it can also provide clearly breathing depth change.

Keywords: bending, plastic optical fiber sensor, surface plasmon resonance, breathing sensor