

Highly Sensitive Fiber-Optic Refractive Index Sensor for Measuring the Salinity of Water

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Summary

High sensitivity refractive index (RI) sensor based on fiber-optic multi-mode interference (MMI) is realized by utilizing fiber loop structure. The MMI sensor detects RI variation as the output spectral-shift. The shift amount to achieve higher sensitivity. The output intensity at a fixed wavelength varies with tracing the spectral shape. The way to achieve higher sensitivity is enhancing the shift amount or sharpness of the output spectrum. In this research, to sharpen the spectrum, the MMI optical fiber sensor was incorporated into a fiber-loop. The RI sensitivity of the sensor system was evaluated by measuring water with changing its temperature. As a result, the sharpness of the spectrum was increased by using the fiber-loop to realize 54 times higher sensitivity than that without fiber-loop. Finally, we measured salinity of water and achieved sensitivity of 1.82×10^{-4} wt%. This sensor system realizes easy and sensitive detection of salinity without any corrosion or degradation in sensor region.