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Acetone Liquid Sensing Based on Fiber Optic Mach-Zehnder Interferometer

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Abstract

Fiber based optical sensors have been widely used in many industries today to detect parameters such as temperature, pressure, vibrations, concentrations and many more. A Mach-Zehnder Interferometer (MZI) is well known for its compact structure and small size which are advantageous for sensing purposes. In this project, an MZI with a singlemode-multimode-singlemode-multimode (SMSM) structure is developed for measuring acetone concentration in reverse osmosis (RO) water. The MZI consists of two single mode fibers (SMF) and two multimode fibers (MMF) spliced together using an arc fusion splicer machine to produce a SMSM structure. The MZI generates a good, reflected interference spectrum where the dip wavelength is red-shifted with the increase of acetone concentration. The sensitivity of the fiber sensor is 1.5391 nm/M within the range of 0M until 4M of acetone concentration. Based on the result, the sensor has a linear response towards the changes of concentration of 94.38%. This preliminary result shows that the proposed sensor can be used to detect acetone concentration to avoid contaminated water that may be of potential concern for human health. © 2021 IEEE.

Author keywords

Acetone Liquid Sensor; Fiber Optic Sensor (FOS); Mach-Zehnder interferometer (MZI); Single mode-multimode-single mode-multimode (SMSM) fiber

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