

Determination of thermo-optic coefficient in liquids with fiber Bragg grating refractometer

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Received 29 June 2007; revised 4 October 2007; accepted 11 October 2007. Available online 29 October 2007.

Abstract

In this work the thermo-optic coefficients of hydrocarbon samples have been determined using etched fiber Bragg grating (FBG), where the effective refractive index (RI) of the fundamental mode becomes dependent on the surrounding refractive index. The technique is based on the cross-sensitivity that the device presents to temperature and refractive index. The thermal response of FBG is characterized for samples with different refractive indices. The inherent temperature effects are distinguished from the RI, due to induced effects changes in the refractive index caused by the thermo-optic effect. For comparison purposes, literature data has been used to work with such parameters for water. The parameter obtained for ethanol $(-3.99 \pm 0.20) \times 10^{-4} \text{ }^\circ\text{C}^{-1}$ at 1550 nm is in close proximity with the literature data, $-4 \times 10^{-4} \text{ }^\circ\text{C}^{-1}$, in the visible range.

Keywords: Etched fiber Bragg grating; Refractive index sensitivity; Thermal sensitivity; Thermo-optic effect