

Abstract

Optical fiber sensors have been widely used in various applications, such as medicine, industrial production, transportation, and civil engineering. In this study, three types of optical fiber sensors are used to measure concentrations of Sucrose and Sodium Chloride solutions. The refractive index is determined for different concentrations of Sucrose solutions range from 10% to 50% and for Sodium Chloride (NaCl) solutions range from 5% to 25% by using Abbe refractometer. The relationship between refractive index and concentration is found to be linear. Three experimental setups, Single Mode Fiber (SMF) sensor, Mach-Zehnder Interferometer (MZI) sensor, and Tipped Fiber Bragg Grating (T-FBG) sensor are constructed and discussed in details. The results showed that the SMF concentration sensor with Light Emitting Diode (LED) of 850 nm wavelength and Laser Diode (LD) of 650nm wavelength has sensitivities of - 0.18 nW/(% w/v) and - 0.1637 nW/(% w/v), respectively, for Sucrose solutions ,and - 0.437nW/(% w/v) and - 0.337nW/(% w/v), respectively, for Sodium Chloride solutions. Greater sensitivity are recorded by using MZI concentration sensor with Laser Diode (LD) of 810 nm wavelength which showed that 0.017nm/ (% w/v) and 0.0474nm/ (% w/v) are the sensitivities for Sucrose and Sodium Chloride solutions, respectively. However, a Tipped FBG concentration sensor with Laser Diode of 1550 nm wavelength showed an optimum sensitivity of 0.00309 nm/(% w/v) for Sucrose solutions and 0.0083 nm/(% w/v) for Sodium Chloride solutions.