

Abstract

Optical fiber refractive index sensors are able to detect liquids refractive indices. Photonic crystal fibers (PCFs) based sensors are today's technology because their strong by physical and mechanical properties such as flexibility, high sensitivity, robustness, the light guiding mechanisms, and etc. In this study, gold nanoparticles (NPs) have been deposited on a PCF, solutions of sucrose, NaCl and glycerol preparation used for refractive index sensing application. Preparation of gold NPs has been accomplished using Pulsed laser ablation methodology at 532 nm and 1064 nm. First, Sucrose, NaCl and glycerol have been prepared with 10%, 20%, 30%, 40% and 50%; their refractive indices have been measured. The etching has been carried out after splicing PCF between two equal lengths single mode fibers (SMFs). second, the gold NPs have been deposited on the etched area of PCF fiber. The free ends of SMFs were connected to 650 nm laser source and optical spectrum analyser (OSA) device. Then the sensing area immersed in the prepared solutions in order to measure the refractive indices. The results showed that the sensitivities of non-deposited PCF sensor, the deposited PCF with prepared gold NPs at 532 nm and 1064 nm is 20.716 ,230243 and 400.426 nm/(% w/v) respectively. The analysis of the morphological properties have been conformed the uniformly distribution of gold NPs in smooth pours silicon surface. The X- ray diffraction (XRD) pattern clarified two phases of gold NPs at 532 nm and the other phase at 1064 nm. From TEM the particle size obtain about and 28 nm at 532 and 1064 nm respectively and From AFM the NPs appeared well distributed and average size particles were 45.32 and 40.45 nm at 532 and 1064 nm respectively. From these physical properties the behaviour of the manufactured sensor at 532 nm is better than that manufactured at 1064 nm.