## Abstract

Photonic crystal fiber (PCF) is widely used for sensing applications. In the present work, the magnetic field sensor based on solid core photonic crystal fiber for sensing application is presented. The general structure of this sensor is applied by splicing short lengths of PCF (LMA-10) between two standard single mode fibers (SMF-28). A laser diode with wavelength (1550nm) has been used as a light source and optical spectrum analyzer (OSA) was used to monitor and record the transmission spectra.

The present work relies on two techniques; the first one is ferrofluid which is implemented with two models, Mach-Zehander interferometer (MZI) with collapsing model and Mach-Zehander interferometer with tapering model. The second one follows Ampere force law.

In the technique which is based on MZI collapsing modal, after the PCF is spliced between SMFs, is passed through glass capillary tube and this tube is filled with ferrofluid which was prepared. As ferrofluid leads to change in effective refractive index of PCF, which in turn affects the transmission of the laser inside the PCF due to the value of refractive index of ferrofluid. The experimental result shows that when the magnetic field strength increases from (5.2mT) to (31.7mT), transmission spectrum shifts toward longer wavelength from (1.58000μm) to (1.58024μm) with sensitivity of (13.2pm/mT).

While the ferrofluid is based on MZI tapering model, after splicing PCF with SMFs, the PCF is tapered in the middle and passed through capillary tube and the tube was filled with ferrofluid, the experimental result shows that when the magnetic field strength increases from (5.2mT) to (31.7mT), the transmission spectra shifts toward longer wavelengths