

Fiber and Optical Waveguide Band Devices for Communication and Biosensing Application

The photonic crystal fiber (PCF) has demonstrated its great potential in the photonics sensing applications. In general, PCFs are made up of silica with microscopic air holes running along the fiber. Due to high design flexibility, PCFs offer numerous advantages over conventional fibers, such as endlessly single mode, large mode area, tunable dispersion, high birefringence, tunable large optical nonlinearity and very low loss. In addition, PCFs are highly responsible for analyte materials and external forces that govern the sensing property. It is used as sensing medium for strain, hydrostatic pressure, temperature, magnetic field and vibration. Apart from them, some chemical and bio-sensor based on PCFs have also been developed for the sensing salinity, pH, DNA, cholesterol and glucose. Especially, PCFs have also been used for the detection, treatment and prevention of diseases and diagnosis for better health in the biomedical applications. Nowadays, cancer is one of the common diseases in the world, which has become a serious problem in human health. It is also a kind of virus called as oncovirus. The smaller in size of the virus and its divergence around the region of cell decide the impact of cancer presence. Increasing rate of cancer urgently demands the next generation of cancer testing equipment to sense the cancer cells as early as possible. Further, the development of biosensor for different region of human is studied. For example, basal cell carcinomas by, optical detection of specific protein in breast cancer cells using micro-structured fiber, detection of breast cancer using photo thermal effect on Nano composite and cancer presence in body fluids such as urine, serum, blood and tumor cells were proposed. With the aim of achieving highly sensitive PCF based sensor for cancer cell detection, three layered dual core PCF sensor was proposed. It contains cancer cell cavity in the cladding region, in which the sample of the cancer cell is infiltrated. The optical power is transferred from the cancer cell cavity to the silica core as it satisfies the phase matching condition. Depending on the sample, the change in refractive index leads to a shift in the loss spectrum. The performance of the proposed sensor is improved by optimization of structure which results into high sensitivity and also gives better birefringence effect in the order of magnitude.