LAB-ON-CHIP BASED OPTICAL BIOSENSORS FOR THE APPLICATION OF DENTAL FLUOROSIS

Abstract: Optical biosensors are highly sensitive devices for detection and analysis. It has vast applications in biomedical research, healthcare, pharmaceuticals, environmental monitoring, and the battlefield. Biosensors consist of a biological entity that can be an enzyme, antibody, or nucleic acid that interacts with an analyte and produces the signal that is measured electronically. A variety of substances including nucleic acids, proteins (particularly antibodies and enzymes) and complex materials (organelles, tissue slices, microorganism), can be used as the biological components. Fluoride content in drinkable groundwater directly affects the quality of drinking water. In this work it has been demonstrated that a 2-dimensional photonic crystal based biosensor with line defect which can detect different fluorides in water. It has been observed from the band structure that for little change in refractive index (RI) there will be a moderate shift in the frequency and hence it acts as a sensor. This indicates that it is highly sensitive for the change in refractive index. Simulation and analysis has been done for calcium fluoride, cesium fluoride, potassium fluoride, lithium fluoride and strontium fluoride and peak has been observed. One such major detection is to detect dental fluorosis caused by the fluorides present in water. Finite Difference Time Domain (FDTD) method has been used for the analysis. MEEP (MIT Electromagnetic Equation Propagation) simulation tool have been used for modeling and designing of photonic crystal.