**High Sensitive Liquid Sensor Based on Topological Edge State of Defective 1-D Photonic Crystal**

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**Abstract:** The present paper describes the design of high sensitive liquid sensors based on topological edge state (TES) of one dimensional photonic crystal (1d-PC). The proposed structure is formed by stacking of two different photonic crystals having same optical parameters (refractive indices) but different physical parameters (thicknesses). Each PC consists of alternate layers of silicon and air as high and low refractive index layers. By combining the two PCs, an edge state has been generated where the localization of electric field is very high. In order to use the PC as a liquid sensor we consider the category of two phase liquids such as heavy oil and sea water. The sensing principle of the PC is based on the shifting in the transmission wavelength of edge state with the change in the refractive index of two phase liquid. The investigation has been done by using MATLAB and simulation on CST and COMSOL software in the frequency domain. The sensitivity of the device is measured in two ways. In first the liquid is filled only into the interface at which the state of PC lies, secondly it is filled into the whole structure of PCs. The sensitivity of PC is found to 445 nm/RIU and 555 nm/RIU in the two cases which has much larger value than reported by previous researchers. Moreover, the quality factor the proposed device has been increased significantly.