Optimizing coupling region as sensing area in optical ring resonator sensor applications

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Abstrak

Optical Ring Resonators (ORR), whether based on fiber optics or an optical micro ring on substrate structures have been studied and explored extensively to be used for optical sensor applications. The outstanding advantage of optical ring resonator structure is its spectral response shape change due to the variations of the refractive index of the surrounding medium, medium loss due to absorption and scattering, and coupling loss between waveguides in the optical ring structure. The change of spectral response due to the variations of optical medium on the optical ring structure is a phenomenon that can be used to sense the optical property change of physical or biological materials. Some developments of Waveguide (WG) ORR sensors are in progress mostly for bio-sensor applications, since it is free from Electromagnetic Interference (EMI) and is non-physically destructive. In this paper, we discuss our research in developing optical bio-sensor in the form of a WG optical ring resonator. The focus of the research is optimizing the coupling region as sensing area to obtain the optimal coupling coefficient for the most sensitive sense. The results show that the variations of coupling coefficient is not linear with respect to the resonant peak output, such that we are able to locate the most sensitive coupling coefficient to sense.