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Finite Element Simulation for Preliminary Study on Microorganism Detection System

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Abstract : A microorganism detection system has a potential to be used with the advancement in a biosensor development. The detection system requires an optical sensing system, microfluidic device and biological reagent. Although, the biosensors are available in the market, a label free and a lab-on-chip approach will promote a flexible solution. As a preliminary study of microorganism detection, three mechanisms such as Total Internal Reflection (TIR), Micro Fluidic Channel (MFC) and magnetic-electric field propagation were study and simulated. The objective are to identify the TIR angle, MFC parabolic flow and the wavelength for the microorganism detection. The simulation result indicates that evanescent wave is achieved when TIR angle > 42°, the corner and centre of a parabolic velocity are 0.02 m/s and 0.06 m/s respectively, and a higher energy distribution of a perfect electromagnetic scattering with dipole resonance radiation occurs at 500 nm. This simulation is beneficial to determine the components of the microorganism detection system that does not rely on classical microbiological, immunological and genetic methods which are laborious, time-consuming procedures and confined to specialized laboratories with expensive instrumentation equipment.

Keywords : microorganism, microfluidic, total internal reflection, lab on chip
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