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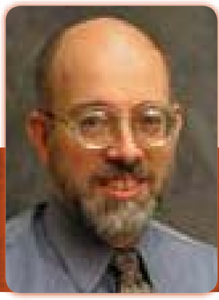

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Biomedical and environmental sensing applications of lateral wave vector response to refractive index

Optical guided wave biosensors transduce molecular binding or chemical changes via effects of refractive index variation on the optical propagation constant in the guiding structure. In some cases, the change in propagation constant is manifested through alterations in coupling conditions, such as for grating and Surface Plasmon Resonance (SPR) devices where the coupling angle is a function of refractive index. Other common approaches, including Mach-Zehnder Interferometers (MZI) and ring-resonators, rely on change in longitudinal phase that is the integral of the longitudinal component of the wave vector in the waveguide. Much less common are sensing devices that exploit the change in the lateral component of the wave vector in response to refractive index. However, the sensitivity of evanescent decay constants in claddings and large ratiometric changes in field amplitude that are available at distances of several decay lengths make sensing lateral wave vector changes intriguing. The Local Evanescent Array Coupled (LEAC) sensor uses variation in evanescent field coupled to an integrated photo detector array to transduce small changes in upper cladding refractive index to changes in photocurrent. Similar to other refractive index sensors, the LEAC technology is a platform that can be adapted to a variety of applications depending on the chemistry in the exposed cladding. When the LEAC waveguide core is patterned with antibodies, it can function as an immunoassay. More recently hydrophobic polymer coatings have been used to allow the same underlying sensor structure to measure benzene and other aromatic hydrocarbon contaminants in water in the ppb range.

Biography

Kevin L Lear is a Professor and Associate Director at Colorado State University. He completed his PhD as an Office of Naval Research Fellow at Stanford University. His subsequent work on vertical cavity surface emitting lasers at Sandia National Laboratories led to commercialization of this technology at Micro Optical Devices, Inc., where he was the Chief Technology Officer. He joined CSU in 1999 as the Rockwell Anderson Associate Professor where his research extended from semiconductor optoelectronics to include a variety of refractive index and fluorescence optical biosensors, microfluidics and biomedical applications.

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