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Further demonstration of a local evanescent field array coupled (LEAC) biosensor concept GUANGWEI YUAN, R. POWNALL, M. STEPHENS, D. DANDY, T. CHEN, P. NIKKEL, K. LEAR, ECE, Colorado State University, Fort Collins, CO 80523 — Low-cost, label-free immunoassay biosensors are needed for point-of-care clinical diagnostics, food safety, environmental monitoring, and biosecurity applications. A novel local, evanescent-field, array coupled (LEAC) photonic biosensor that can simultaneously sense multiple viruses, proteins, or DNA oligomers is being investigated. The sensing mechanism relies on the formation of a biological adlayer via specific binding of an analyte target to one of several localized patches of immobilized biological molecule probes (antibodies, ss-DNA, aptamers). The attached analytes modify the waveguide cross-section and thus the optical field. A buried array of evanescently coupled photodetector elements along the length of the waveguide, each opposite a region of specific antibody type, locally sense the modification in the evanescent field due to adlayers of bound analytes. Proof-of-concept experiments have demonstrated strong optical modulation responses to artificial adlayers varying from 17 to $\sim$100 nm in thickness as observed by near-field scanning optical microscopy. LEAC sensors with electronic readout circuits are have been fabricated in a commercial 0.35 μm CMOS technology. Currently, research efforts are characterizing the effect of different polymer and organic molecules adlayers on the detected optical signal using these sensors.

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