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**Evanescent field response to small patterned features on a planar waveguide biosensor** GUANGWEI YUAN, R. YAN, M. STEPHENS, D. DANDY, K. LEAR, ECE, Colorado State University, Fort Collins, CO 80523 — A novel optical sensor is developed on the concept that the evanescent field surrounding the core of an appropriately designed waveguide can be very sensitive to the local refractive index of the cladding surrounding the core. The formation of a protein- or ssDNA-based adlayer via specific binding of an analyte target to one of several localized patches of immobilized biological molecule probes can be detected by measuring the change in the evanescent field of the waveguide. The biosensor studied is based on a waveguide fabricated from a high refractive index silicon nitride thin film surrounded by a lower cladding of silicon dioxide and an upper cladding of air or water. To detect small features, the thickness of the waveguide core is optimized to be a fraction of a micrometer. In this study, the response of the sensor to small polymer features ($1\times1$ $\mu m^2$, 20 to 80 nm thick) with indices of refraction comparable to biological material is evaluated using near field scanning optical microscopy (NSOM). The results have significant implications for the density of a sensor array, particularly in two-dimensional arrays. Issues such as transient interference and positional dependency are addressed.

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