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## An integrated optical polarimetric interferometer for bio/chemical sensing applications

Dan-feng Lu Chinese Academy of Sciences, China

**S** ingle-mode glass waveguides made by potassium-ion-exchanging are low-cost and low-loss waveguides with a negligible modal birefringence, and they allow to simultaneously excite the zeroth-order transverse electric (TE<sub>0</sub>) and magnetic (TM<sub>0</sub>) modes with a single laser beam. After local deposition of a tapered nanometric film of high-index transparent materials on the glass waveguide to form a composite optical waveguide (COWG) based on the tapered velocity theory, a large modal birefringence was induced in the covered region of the structure due to the high refractive-index (RI) contrast. This local large modal birefringence makes the evanescent field with the TE<sub>0</sub> mode much stronger than that with the TM<sub>0</sub> mode. This difference enables the COWGs to be used as a single-beam polarimetric interferometer sensor for label-free real-time detection of bio/chemical molecules. The refractive-index sensitivity (S<sub>RI</sub>) of the COWG-based interferometric sensor was investigated. The best-fit of the measured S<sub>RI</sub> with a four-layer homogeneous waveguide model led to the equivalent thickness (T<sub>eq</sub>) for the tapered layer of the COWG used. With the value of T<sub>eq</sub>, the sensitivity of the COWG sensor to adlayer thickness can be determined. Adsorption of lead ions from aqueous solution and the self-assembly process of cytochrome-*c*/PSS multilayer film were *in situ* monitored by use of the COWG sensor. The RI of the lead (II) adlayer with a thickness given as 0.264 nm was determined to be ~1.945 at the maximum coverage. The surface coverage of adsorbed cytochrome *c* was obtained from the combination of the adlayer-thickness sensitivity and the measured phase-difference change.

## Biography

Dan-feng Lu received the Ph.D. degree in Physical Electronics from Institute of Electronics, Chinese Academy of Sciences (CAS) in 2012. She currently works as an Assistant Researcher in the fabrication of integrated optical waveguides for chemical and biochemical sensing application. She has published more than 15 papers in reputed journals.

dflu@mail.ie.ac.cn