Guided-mode resonance biochip system for early detection of ovarian cancer

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A high-accuracy, sensor system has been developed that provides near-instantaneous detection of biomarker proteins as indicators of ovarian serous papillary carcinoma. Based upon photonic guided-mode resonance technology, these high-resolution sensors employ multiple resonance peaks to rapidly test for relevant proteins in complex biological samples. This label-free sensor approach requires minimal sample processing and has the capability to measure multiple agents simultaneously and in real time. In this work, a sensor system that uses a fixed-wavelength source with a shaped input wavefront to auto-scan in angle has been developed. As binding events occur at the sensor surface, resonance reflection peak shifts are tracked as a function of incident angle on an integrated CMOS detector. The amount of angular shift is linearly correlated to the quantity of biomarker protein in a biological sample. Multiple resonance peaks provide increased detection information about the binding dynamics occurring at the sensor surface, thus decreasing false detection readings. Simultaneous detection of multiple biomarker proteins in parallel with sensitivities in the pM range contributes to the potential for differential real-time data analysis. A biochip system prototype has been developed and the system performance characterized. Identification and quantification of protein biomarkers that are up- or down- regulated in blood and serum as indicators of ovarian cancer will be presented.