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Label-free electrical detection of ovarian cancer biomarker CA-125 with a novel nanoscale coaxial array[1] MICHELLE ARCHIBALD, BINOD RIZAL, DONG CAI, TIMOTHY CONNOLLY, MICHAEL J. BURNS, MICHAEL J. NAUGHTON, THOMAS C. CHILES, Boston College — Technologies to detect early stage cancer would provide significant benefit to cancer disease patients. Clinical measurement of biomarkers offers the promise of a noninvasive and cost effective screening for early stage detection. We have developed a novel 3-dimensional nanocavity array for the detection of human cancer biomarkers. This all-electronic diagnostic sensor is based on a nanoscale coaxial array architecture that enables molecular-level detection. Each individual sensor in the array is a vertically-oriented coaxial capacitor, whose capacitance is measurably changed when target molecules enter the coax annulus. The coaxial array facilitates electrical-based detection in response to antibody or molecular imprint based recognition of a specific cancer biomarker, thereby providing a label-free, non-optical measurement. Here, we describe this nanoscale 3D architecture and its application to the detection of the ovarian cancer biomarker CA-125. We report our efforts on the development of molecular detection of CA-125 based on antibody-functionalized nanocoax arrays as well as molecular imprints. The results demonstrate the feasibility of using these arrays as ultrasensitive devices to detect a wide range of molecular targets, including disease biomarkers.

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