Journal of Nanoelectronics and Optoelectronics, vol. 8(2), 2013, pages 156-159

Electrical properties of silicon-based nanogap electrodes for label-free biomolecular detection

Abstract

The electrical properties of 6-, 33- and 89-nm gap structures were systematically studied to evaluate the feasibility of these structures to be used in biomolecular sensing devices. The fabrication and morphological characterization of these structures were previously reported. In this report, we electrically probed the presence of nanogap through current measurement. The effects of electrolytes to the capacitance profiles of these structures were systematically studied with air, water and various dilution of phosphate buffer saline. Increment in capacitance was found with the increment in electrolyte concentration. Improvement in current flow, capacitance, permittivity, and conductivity were observed with the smaller size nanogaps, suggesting their applications in low power consuming devices. Since nanogap-based dielectric biosensing devices needs to be operated with low level of current to avoid biomolecular damage, these structures should have potential applications in dielectric-based biomolecular detection using a low cost dielectric analyzer.

Keywords

Dielectric-based biomolecular detection; Double-layer capacitance; Nanogap electrodes