Innovative Carbon Nanotube Based Microsensor for Early Diagnosis of Ovarian Cancer

Lee, JooUn (School: Tenafly High School)

Ovarian cancer (OVC) is one of the leading causes of death in women in the US. With only a 15% survival rate in the late stages, a fast and accessible method of OVC biomarker detection in human serum is a crucial task for diagnosis at an early stage. The primary focus of the research is the development of a sensor that can detect small quantities of an OVC biomarker named CA-125 in microliters of a fluid sample. The sensor is based on a nanoscale interdigitated gold electrode, coated with carbon nanotubes (CNTs) functionalized with carboxyl groups (-COOH). An atomic force microscope (AFM) was used to confirm the deposition of the CNT layer, which enhances the capacitive response upon contact with CA-125. I used multiple samples with various antigen concentrations, including the OVC cutoff-limit of 35 U/mL, to compare the signal response between each sample. The capacitance of the sensor measured by a probe station showed a considerable change after contact with CA-125, indicating that it successfully detected the biomarkers in the microfluid samples. This sensor is designed for enhanced sensitivity and drastically reduced processing time, size, and cost compared to the invasive and time-consuming techniques of conventional OVC diagnosis methods such as biopsy, imaging tests, or blood tests. Additionally, it has a potential to be used as a sensing platform for any other type of disease with a blood biomarker.