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Titanate TiO₂ nanowire bio-scaffold as a novel sensor for cancer cell differentiation

Hanan Alismail, Yuchun Du, Jianhong Zhou and Z Ryan Tian
University of Arkansas, USA

Human body cells undergo continuous division to compensate the cell loss in the body. This process is highly regulated, and any abnormality can cause cancer, which is a hot topic nowadays. Indeed, cancer cell research has been ongoing since decades and scientists are trying to figure out the mystery behind it. Up to date, treatment and diagnostic tools are under development and still there is a strong need for new technology in drug delivery, screening, and monitoring. Our contribution will be introducing a new technology that can be used in pathology lab for cancer cell screening and detection. Our first project was upon turning a bioscaffold into an electrochemical sensor. A simple, sensitive, and reliable method that can distinguish different cancer cell lines from normal cells is critical for cancer screening and treatment, in which little has been reported in literature on turning a bioscaffold into an electrochemical sensor. In the present work, a sensory nano-bioscaffold was incubated with two types of human breast cancer cells, benign and aggressive, and one type of corresponding normal human cells, respectively. These three types of cells showed significant differences on the bioscaffold-sensors in term of impedance magnitude, suggesting that these cells upon bounding on the scaffold have altered the surface charge-density on the nano-bioscaffolds. This new method can be potentially used in various important applications in cancer screening and monitoring, which are doable *in vivo* at ultra-low-cost and in real-time.

halismai@email.uark.edu