

Past and Present Research Systems of Green Chemistry

September 14-16, 2015 Orlando, USA

Detection of human osteosarcoma cell (MG-63) and evaluation of the cytotoxicity of cisplatin using the TiO₂ nanotubes modified wireless magnetoelastic sensing device

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This paper describes the real-time quantification of human osteosarcoma cell (MG-63) concentrations and evaluation of the cytotoxicity of the anticancer drug cisplatin using a wireless magnetoelastic sensing device. The sensor is fabricated by coating a magnetoelastic ribbon-like sensor with a layer of polyurethane that protects the iron-rich sensor from oxidation and titanium dioxide nanotubes upon the surface of polyurethane provides a cell-compatible surface. The titanium dioxide nanotubes (TiO₂ NTs) are easy to be dispersed at substrate and spread around on the surface of polyurethane. In response to a time-varying magnetic field, the magnetoelastic sensor longitudinally vibrates, emitting magnetic flux that can be remotely detected by a pick-up coil. No physical connections between the sensor and the detection system are required. The wireless property facilitates aseptic biological operation, especially in cell culture as illustrated in this work. The resonance frequency changes in response to properties changes of a liquid culture medium and cells adhesion to the sensor as MG-63 consumes nutrients from the culture medium in growth and reproduction. The adhesion of cells on the sensor's surface results in a decrease in the resonance frequency and the amount of adhesion was proportional to the cell concentration. A linear response was obtained in cell concentrations of $1 \times 10^4 \sim 2 \times 10^7$ cells mL⁻¹, with a detection limit of 1×10^4 cells mL⁻¹ at a noise level of ± 20 Hz.

Biography

Xilin Xiao received his master degree of health toxicology from University of South China, PR China in 2004, and PhD in analytical chemistry in 2010 from Hunan University. From 2011 to 2012, he left to the University of Florida joined the WeihongTan's Research Group as a visiting scholar. He is currently a full-time associate professor in the College of Chemistry and Chemical Engineering, University of South China, PR China. His primary research interests concern the chem/biosensors.

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