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A mammalian cell-based nanomechanical biosensor

Hai-Feng Ji, Mei-Juan Han, Minghong Li, Wenjina Du and **Jun Xi**
Drexel University, USA

As a natural living system, mammalian cells have the ability to respond to various environmental cues in distinct ways at both the cellular and molecule levels. Such unique ability of the cells can be utilized for the rapid detection of chemical and biological analytes. In this report, we have demonstrated the feasibility of a novel cell-based biosensor that utilizes a microcantilever to convert a cellular response to a measurable mechanical response. With this innovative approach, we have been able to detect the distinct responses of α-cyclodextrin and methyl-β-cyclodextrin with mammalian cells based on their differential effects on cells. This study has for the first time demonstrated the feasibility of cell-based microcantilever sensing, which capitalizes the unique capability of microcantilever to convert cellular response to a measurable mechanical response. Compared to other sensing technologies, cell-based microcantilever sensing is a label free, noninvasive technology that provides a real-time monitoring capability based on the induced cellular response. In addition, it has a good specificity with a low production cost, low-power consumption, and a small size. This study has established a foundation for the future development of a highly sensitive sensing platform for environmental, medical, toxicological, and defense applications.

Biography

Hai-Feng Ji is currently an Associate Professor in the Department of Chemistry at Drexel University. His research interests focus on micro/nano biosensors, MEMS devices, surface modification for sensors, and nano-assembly of organic molecules. He is currently a co-author of more than 120 peer-viewed journal articles and book chapters.

hj56@drexel.edu