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TITLE

Approaches to increasing surface stress for improving sensitivity of nanomechanical biosensors

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Microcantilever sensor technology has been steadily growing for the last fifteen years. While we have gained a great amount of knowledge in microcantilever bending due to surface stress changes, which is a unique property of microcantilever sensors, we are still in the early stages of understanding the fundamental surface chemistries of surface-stress-based microcantilever sensors. In general, increasing surface stress, which is caused by interactions on the microcantilever surfaces, would improve the S/N ratio, and subsequently the sensitivity and reliability of microcantilever sensors. To achieve a fast response, the preferred surface modification approach for sensing involves conjugating an ultrathin layer of receptors on the surface of the microcantilevers. However, the reported surface stresses of these sensors are in general quite small, due to both the poor characteristics of the gold surface and the surface chemistries, and thus surface modification is critical for developing sensitive and reliable microcantilever sensors. To achieve this goal, a better understanding of the core parameters that determine the magnitude of the interaction-driven surface stress needs to be established in order to improve the sensitivity, stability, and reproducibility of microcantilever sensors. In this talk, I will summarize the strategies to increase surface stress, in case a large surface stress can not readily be reached. I will also discuss our perspectives on microcantilever sensors based on surface stress changes. Conformational changes of proteins are used as examples. Microcantilevers have been proved to be an outstanding transducer for chemical and biological sensors with on-chip circuitry capability and extreme sensitivity.

Biography

Haifeng Ji is an Associate Professor in the Dept. of Chemistry at Drexel University since 2008. Prior to joining Drexel, I was an Associate Professor at Louisiana Tech University with joint appointments at the Institute for Micromanufacturing and Chemistry Dept. He is specialized in fabrication and application of microcantilever sensors for cancer biomarker detection and environmental applications. He has authored and co-authored over 100 peer-reviewed journal publications.