

Integrated Molecular Sensor Systems

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The capability to quickly and reliably sense the absence or presence of target molecules can be a matter of life or death, not only for human beings but also for many other species on our planet. Early disease diagnosis, timely environmental monitoring of toxicants and pollutants as well as accurate allocation of explosive materials are just examples. Although a large number of research articles on sensors are published every year, very few sensor devices meet the challenges of the real-world application of sensors. Bulky size, high cost, dependence on operators, and lack of wireless communications are classical barriers for sensors to enter in our everyday life.

In this lecture, I will present various concept of molecular sensing addressing the aforementioned problems and challenges, illustrated by devices recently developed in our lab, Sensor devices based on micromechanical resonators and hybrid electrochemical – conductometric - colorimetric approaches will be discussed together with their integration with wireless data transmission at a system level. I will give an overview of ongoing research and knowledge in understanding and manipulating the device design, material properties, electronics and optimization use of sensors in real-word environment. Finally, I will provide examples of integrated sensor devices that have been successfully validated.

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