

The **Nehorai and Yang Labs** (ESE) are developing ultra-sensitive, label-free biosensors collaboratively. A simple, inexpensive, accurate, ultra-sensitive and label-free chemical and biological sensing device is of great importance to biomedical research, clinical diagnostics, and pharmaceutical applications. With the capability to manipulate, control and detect biological solutions of interest in nano- or micro-liter, the miniaturized diagnostic devices have attracted significant attention as efficient systems for ultra-sensitive sensing and detection of disease-bearing biomarkers, virus related to certain diseases and antibody to a specific antigen in patients' body fluids. Rapid progress in nanotechnology has prevailed in the development of miniaturized label-free bio/chemical sensing devices, in turn improving the resolution of the sensing devices to an unprecedented level for diagnosis of various diseases in minutes with improved accuracy. Quantum dots (QD) represent a novel class of semiconductor nanocrystals with the capability to emit light in a certain spectral window. This team will tag microspheres to QDs for display of various antibodies, which should allow multiplexed optical coding of captured biomolecules. Figure 6 shows the schematic illustration of this QDs-based high throughput sensing device. Different groups of microsphere with various capture reagents, such as antibodies, are trapped on a chip (Figure 6A). The target molecules will be caught by the capture reagents on the microsphere and subsequently revealed by the QDs embedded in nanosphere (Figures 6B and 6C). At the end, an individual group of microsphere with the same captures reagents (illustrated by the same color in Figure) will be released individually to achieve sorting of various molecules in a crude solution. Yang Lab will focus on fabrication of the device. Nehorai Lab will focus on statistical design of the device and develop efficient and automatic imaging signal algorithms for real-time processing of data acquired from the device.

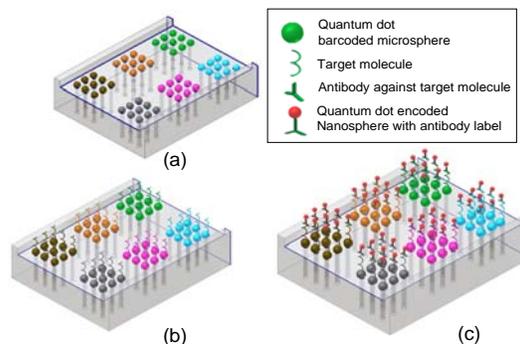


Figure. An illustration of high-throughput sensing using arrays of antibodies functionalized microspheres on a chip.

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