



LIQUID CRYSTAL MATERIALS
RESEARCH CENTER
SPECIAL SEMINAR SERIES

**Color is Power: Application of Liquid Crystals in
Bioassays and Biosensors**

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Human eyes can distinguish about 10 million different colors but only 100 different grey scales. Therefore, in bioassays or biosensors, a readout system that is based on different colors rather than different light intensities provides tremendous advantages. Liquid crystals (LCs) are materials known to give many different colors depending on their average orientations. Moreover, because the orientations assumed by LCs near surfaces are very sensitive to molecules adsorbed on surfaces, LCs can be used to amplify protein-protein binding events into colorful signals which are readily visible to the naked eye. Recently, we have successfully demonstrated a variety of LC-based bioassays and biosensors which have broad applications in environmental monitoring, clinical diagnosis and defense system.

The bioassays and biosensors to be discussed in this presentation include: (1) A protein assay which shows clear dark or bright signal when the protein concentration is above a critical value. (2) An LC based microfluidic immunoassays suitable for differentiating and quantifying antibody and antigen concentrations through colors. (3) A highly specific proteases assay which can report the enzymatic activities of trypsin acting on immobilized oligopeptides. (4) A real-time pH sensor which can follow the diffusion of H⁺ near an aqueous/LC surface, and its application in penicillin detection. These examples demonstrate the potential utility of LC colors for developing simple, low-cost and portable bioassays.

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