

SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

ULTRA HIGH QUALITY FACTOR MICRATOROID FOR CHEMICAL AND BIOMEDICAL SENSING APPLICATIONS

DISSERTATION DEFENSE

by

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Abstract: Optical whispering gallery mode (WGM) microcavities have drawn attentions in various types of sensing, such as chemical- and bio-sensing. Even though various types of microcavity geometries have been investigated, research about on-chip WGM toroidal resonator has been discontinued for the sensing applications in aquatic environment. The strong benefits of the microtoroid are ultra-high-Q and small mode volume leading to high sensitivity to small change of environment, surrounding media refractive index change or light scatterer induced effective refractive index change. By using this ultrahigh-Q WGM resonator, radius $>50\text{nm}$ polystyrene nanoparticle are detected in aquatic environment. In addition to the polystyrene nanoparticle sensing, individual synthetic hemozoin crystals are detected and its size is measured. The hemozoin crystal sensing ultimately leads to malaria infection diagnose. A sol-gel method fabricated microlaser, co-work with Lina He, extended the sensing capability, detecting $>30\text{nm}$ radius polystyrene nanoparticle. Since the water experiment is challenging and tackling the difficulty is main task, theoretical investigations are performed about WGM resonance quality factor, resonator mode volume, and noise to minimum detectable particle size. The research described in this dissertation will shed light on advanced chemical- and bio-sensor developments.

DATE: Wednesday, May 22, 2013

TIME: 2:30 p.m.

PLACE: Green Hall, Room 0120

Dissertation advisor:
Dr. Lan Yang

This seminar is in partial fulfillment
of the Doctor of Philosophy degree