Bar-Ilan University
אוניברסיטת בר-אילן

Faculty of Exact Sciences
Department of Chemistry

הפקולטה למדעים מדויקים
המחלקה לכימיה

S E M I N A R

Wednesday 05/06/19, 11:00 am

Building 211, seminar room

SPEAKER:

Dr. Ora Simcha Bitton

Nanofabrication facility,

Weizmann, Israel

TOPIC:

"Vacuum Rabi splitting in a plasmonic cavity at the single quantum emitter limit"

The strong interaction of individual quantum emitters with resonant cavities is of fundamental interest for understanding light–matter interactions. Plasmonic cavities hold the promise of attaining the strong coupling regime even under ambient conditions and within subdiffraction volumes. In this study, we show that one can observe strong coupling in the limit of a single quantum emitter positioned within a plasmonic cavity. We use a unique technique to fabricate silver bowtie plasmonic cavities and couple them to semiconductor quantum dots (QDs). Scattering spectra registered from individual plasmonic cavities containing one to a few QDs show vacuum Rabi splitting, indicating that the strong coupling regime is approached in these systems. A coupling rate as high as 120 meV is registered even with a single QD. Rabi splitting is also observed in photoluminescence (PL) and electron energy loss spectroscopy spectra, clearly indicating that the transparency dips in the scattering spectra are due to a genuine coupling of the plasmon and QD excitations. Second-order correlation functions of the PL from individual devices manifest non-classical emission through the photon antibunching effect. Interestingly, we find discrepancies between the scattering and PL spectra. A theoretical analysis based on an extended Jaynes-Cummings model attributes these differences to the involvement of dark excited states of the QDs in the dynamics.