Bar-Ilan University
אוניברסיטת בר-אילן

Faculty of Exact Sciences
Department of Chemistry

הפקולטה למדעים מדויקים
המחלקה לכימיה

S P E C I A L S E M I N A R

Wednesday 18/12/19, 11:00 am

Building 211, seminar room 112

SPEAKER:

Dr. Daphna Shimon

School of Chemistry, Tel Aviv University

TOPIC:

Magnetic Resonance Study of Materials: From Nuclei to Electrons and Back

Abstract:

Nuclear magnetic resonance is an extremely powerful technique that can give structural information on the atomic scale in both crystalline and amorphous solids. Here I will explore the use of nuclear magnetic resonance techniques to study three different types of material systems. First, I will show how solid-state NMR can characterize reactions that take place inside porous materials. I will then introduce dynamic nuclear polarization (DNP), which is a method for increasing the NMR signal, and show two examples of how we can use intrinsic structural defects in solid materials to learn about both the DNP process itself, and importantly also about the materials and their structure. Three materials will be discussed: 1) Mesoporous SBA-15 (silica) functionalized with amine groups on the surface of the pores, for the application of carbon capture. The amine groups react with CO_2, effectively removing it from gas mixtures, as a way to stop it from reaching the atmosphere. 2) Diamond powder with substitutional nitrogen centers (a.k.a. P1 centers), which can be used for DNP enhancement of the ^{13}C-NMR signal. Diamond are biocompatible and can be used for in-vivo imaging. They are also important target for developing DNP at room temperature, with the goal of enhancing nuclei outside of the diamond powder. 3) Silicon microparticles with surface defects that can act as DNP sources and can be used to enhance ^{1}H nuclei on the surface of the particles. The ^{1}H nuclei occur on the surface due to degradation of the silicon and the formation of an oxide layer, and through DNP we are able to identify how sensitive the surface is to changes in ambient conditions.