

You are cordially invited to attend this special seminar to be held on

Thursday, January 14th, 16:00
Room 438, Wolfson Building of Mechanical Engineering

High resolution microscopy for better understanding of composite materials

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Polymer nanocomposites (PNC) are considered next-generation advanced materials, combining high performance, low mass and low cost. Aligned carbon nanotubes (A-CNT) enables the design of anisotropic PNC with the desired properties of CNTs. This creates unique possibilities for material properties fabrication. However, experimentally measured properties (mechanical, electrical and thermal) of A-CNT based PNC fall short of the theoretical predictions, sometimes by orders of magnitude. The results suggest that the true PNC structure is different than presumed, and emphasize the need for tight control over the composite nano/micro structure.

In this talk, the use of electron microscopy to quantify the morphology of CNT based PNC will be addressed. Three examples of three different functions will be discussed: pull-out length at fracture surfaces and its contribution to fracture toughness; coaxial coating for energy storage and thickness effect on capacitance; and full 3D network structure acquisition, demonstrating the effect of volume fraction (Vf). Experimental data (thermal, electrical and mechanical properties) will also be discussed, as the microscopy images are translated to data and used to explain trends in properties enhancement. Micro- and nanoscale visualization is thus necessary for optimizing the design of smart, hierarchical composites. The knowledge acquired from these examples is invaluable for my next research goal of further expanding the understanding of these materials from both a mechanical and an electrical perspective.

Biosketch



Dr. Noa Lachman is a postdoctoral Associate at the department of Aeronautics and Astronautics at MIT. She received a B.Sc. (2002) in Chemistry and Physics from the Hebrew University in Jerusalem, Israel, and completed her Ph.D. work (2010) in the department of Materials and Interfaces at the Weizmann Institute of Science. Her research with Prof. Wardle at MIT focuses on tailoring and imaging of aligned carbon nanotubes (A-CNT) based composites for various application, including energy storage and multi-functional structure materials. Dr. Lachman uses experimental techniques to obtain knowledge of nano-structure effect on mechanical and

functional properties of these new materials. She aims to develop a structure-function dataset which will enable the design of new materials with improved efficiency and performance. Dr. Lachman has authored and co-authored 18 journal articles.