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Institute of Advanced Studies

המכון ללימודים מתקדמים
ע"ש מורטימר וריימונד סאקלר

TEL AVIV UNIVERSITY

אוניברסיטת תל-אביב

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פרופסור לודוויק לייבלר
מעבדה לחומר רך וכימיה
ESPCI, פריז, צרפת

Lecture *הרצאה*

"SELF-HEALING RUBBERS, SUPER-PROCESSABLE PLASTICS AND UNIVERSALLY DISPERSIBLE COLLOIDS FROM SUPRAMOLECULAR ASSEMBLIES"

The lecture will be held on Thursday,
27 February 2014, at 11:00, in Roon 011,
Classroom Building, Faculty of Engineering
Tel-Aviv University, Ramat-Aviv

ההרצאה תתקיים ביום חמישי,
27 בפברואר 2014, בשעה 11:00,
בחדר 011, בניין כיתות, הפקולטה להנדסה,
אוניברסיטת תל-אביב, רמת-אביב

Light refreshments will be served before the lecture

כיבוד קל יוגש לפני ההרצאה

The lecture will be in the framework of a series

ההרצאה תתקיים במסגרת סדרה בנושא:

The DMS&E Lectureship on the occasion of the founding of the Department of Materials Science and Engineering

Abstract

Supramolecular chemistry can help to solve the dilemma of making easily processable materials while still maintaining good polymer-like properties. It can also allow synthesis of materials with unique hitherto unattainable properties.

First, I will show that branched oligomers equipped with complementary and self-complementary multiple hydrogen bonding units small molecules can exhibit rubber-like properties: large extensibility and low creep under stress. Contrary to classical elastomers, however, when broken or cut supramolecular rubbers can be simply mended by bringing together fractured surfaces even at room temperature. Interestingly, the process of breaking and healing can be repeated many times and healing can be achieved even when broken parts were kept apart for quite a long time. Yet, supramolecular rubbers are not self-adhesive. These observations shed new light on physics of associations and organisation and open challenging questions about unusual dynamics, fracture and adhesion of supramolecular assemblies.

The second example concerns linear amide oligomers equipped with imidoazolidone groups. Properly designed these molecules behave like semi-crystalline thermoplastics of high molecular weight, but at high temperature they are super-processible since they flow like oil. Good mechanical properties are achieved by control of interplay between directional and dispersive interactions and of resulting order-disorder transition.

Eventually I will discuss how supramolecular associations can be used to provide a convenient tool to prepare colloidal particles and in particular carbon nanotubes that can be dispersed in solvents of any chemical nature, easily recovered and re-dispersed.