Department of Materials
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הפקולטה להנדסה
ע"ש איבי ואלדר פליישמן
אוניברסיטת תל אביב

המחלקה למדע
והנדסה של חומרים

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

Monday, May 8th, 15:00
Room 118, Wolfson Mechanical Engineering Building

Novel biocomposite materials and constructs based on unique collagen fibers for soft tissue bio-mimetics

by

Mirit Sharabi

Under the supervision of Prof. Rami Haj-Ali and Prof. Dafna Benayahu

Soft tissues can be idealized as fiber-reinforced composite materials. From a mechanical point of view, collagen fibers are the main load bearing constituent of the tissue. As such, they are responsible for its stiffness and strength.

The growing need in soft tissue substitutes led to massive efforts to produce new materials that can replace damaged native tissue. Although biological compatibility is an important property of these biomaterials, mechanical biocompatibility is as crucial aspect that often does not get enough attention.

The objectives of the present work were to create a new type of biocomposite materials and constructs. To that end, biomimetics principles were applied by using the shape and structure of native soft tissues. Hence, ultra-long collagen fibers extracted from soft coral were combined with alginate-based hydrogel matrix having different fiber fractions and orientations. The proposed material combinations allowed tailor-designed and hyperelastic mechanical behavior similar to native tissues, e.g. cornea, blood vessels and annulus fibrosus. The new materials and constructs were fabricated and mechanically tested alongside with predictive finite-element (FE) material and structural models that can help in the design of complicated bio-composite constructs. This work enhanced our understanding to the structure-function behavior and the influence of the isolated bio-composite components on the overall mechanical behavior. These new materials and constructs with a combination of numerical simulations have a great potential to create the next-generation of tailor-designed biomaterials for soft issue substitutes.