UNIVERSITÀ DEGLI STUDI DI PADOVA

Dipartimento di Fisica e Astronomia Galileo Galilei

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Surface forces and lubrication properties of adsorbed chitosan thin films

Inter-surface forces mediated by polymer films are important in a range of technological and industrial situations. In cosmetics, applications such as hair conditioning typically rely on the adsorption of polyelectrolyte films onto the charged surface of hair fibers, whose contact mechanics and tribological properties are central in determining the final sensorial perceptions associated with the cosmetic treatment. A major current challenge to be tackled by the cosmetic industry is to design high-performance products employing bio-sourced polyelectrolytes, with the aim of achieving eco-sustainable processes and products. In this context, we have studied the mechanical properties of thin films obtained by adsorption of chitosan onto negatively charged surfaces. We use a Surface Forces Apparatus allowing for the simultaneous measurement of film thickness and friction force as a function of the applied normal load and shear velocity. We show that, in salted aqueous medium, adsorbed chitosan films behave as neutral pseudo-brushes and give rise to repulsive inter-surface forces whose range increases with the polymer molecular weight. Moreover, we observe that under shear forces, chitosan layers exhibit a transition from a low to a high friction regime under increasing confinement.

Condensed Matter Seminars