Polymers: Surface Interactions, Assembly, Aggregation, Structure, and Dynamics

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Polymers are the building blocks of a large number of devices from fuel cell membranes to novel electro-optical devices. Polymers often associate into aggregates, which serve as the building blocks in any of their applications. Our research focuses on the study of the factors that control the association of polymers and the effects of aggregation on their properties. The packing and dynamics of polymers within those supramolecular aggregates determine the overall properties of the system. Structure and dynamics in polymer matrices span multiple time and length scales that are investigated using a set of complimentary techniques. Atomic Force Microscopy (AFM) and Fluorescence Microscopy together with X-Ray and Neutron techniques are used to study the structure of the aggregates formed by polymers. Nuclear Magnetic Resonance as well as Neutron Spin Echo are used to investigate the dynamics. The experimental results are compared with Molecular Dynamic Simulations. An Example of an Atomic Force Microscopy Image of two different Morphologies of a Polyester-Grafted Poly(*para*phenyleneethynylene) is shown below.

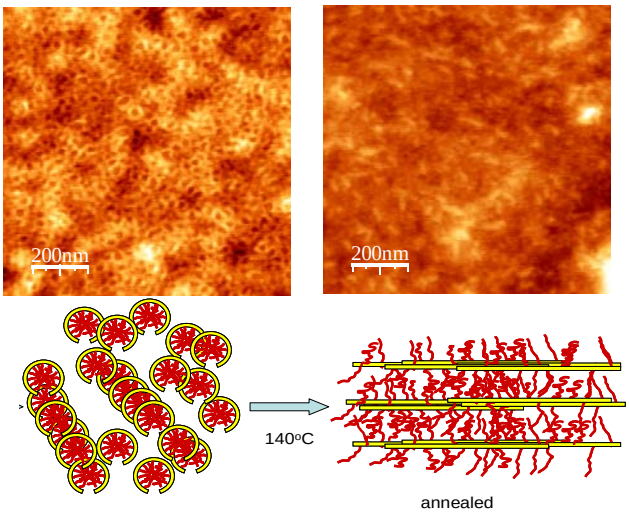

Figure X: Atomic Force Microscopy images of a Polyester-Grafted Poly(*para*phenyleneethynylene). The left image corresponds to a drop-cast film and the right image to the same film after annealing. The scheme bellow represents a suggested arrangement of the molecules within the supramolecular structure.

Undergraduate participants will gain basic understanding of the physical chemistry principles that underline the assembly of polymers. They will work in an interdisciplinary environment where physicists, chemists and materials researchers collaborate to investigate these polymers.