Shining Light on Materials: Spectroscopy of Nanofibers and Photoactive Materials

The properties and function of materials strongly depend on their molecular structure. In particular, controlling molecular anisotropy allows preparing materials with optimized mechanical, optical or electrical properties, etc. My lab develops and applies advanced methods in infrared and Raman spectroscopy to gain new insight into the structure of soft materials such as electrospun polymers, ultrathin films, supramolecular complexes, molecular glasses and azomaterials. In this presentation, I will highlight our recent work on two classes of materials. First, I will describe our work on individual electrospun fibers that revealed for the first time clear correlations between fiber diameter, molecular orientation, mechanical properties, and the unexpected partial disentanglement of polymer chains. Second, I will demonstrate that irradiation of photoactive azomaterials leads to a sub-molecular photoplasticization that helps understanding their unusual athermal malleability, and explain why halogen-bonded supramolecular azo complexes surpass their hydrogen-bonded analogs when writing surface relief gratings.