



Πανεπιστήμιο Κύπρου
Τμήμα Χημείας

Το Τμήμα Χημείας του Πανεπιστημίου Κύπρου
σας προσκαλεί στην παρουσίαση της Διδακτορικής Διατριβής
της κ. **Elisas Alloa**
την **Πέμπτη, 5 Δεκεμβρίου 2019** (ώρα 10:30, Αίθουσα B127)
με τίτλο:

«Structural characterization of organic conjugated dyes through vibrational and time-resolved techniques»

(Ερευνητική Σύμβουλος: Αναπλ. Καθηγήτρια Σοφία Χ. Hayes)

Περίληψη

The development of optoelectronics applications is directly related to the structural characterization of organic conjugated molecules. Vibrational spectroscopy represents an effective method to study conformational changes of organic molecules under variable conditions and it is employed in my work on perylenes, oligofluorenes and polydiacetylenes in order to accomplish specific requirements in the field.

Perylene bisimides (PBIs) are dyes known for combining high absorption and emission in the visible region with their thermal and photochemical stability. H-bond-directed aggregation driven by free imide groups has been reported to promote the uncommon J-type aggregate formation of PBIs. J-aggregates are highly desired thanks to their bathochromically shifted narrow absorption and fluorescence due to excitonic coupling, together with hyperchromicity and superradiance compared to the monomer. Herein we present the water soluble showing interesting aggregation in water and in the solid state. Unlike its hydrophobic counterparts (a comparative study is also carried on in my thesis), MEG-PBI aggregates in water upon increasing temperature, indicating an entropy driven self-assembly. Temperature-dependent Resonance Raman (RR) spectroscopy was employed for the structural characterization of MEG-PBI in aqueous solution versus toluene and in aggregated thin films, employing excitation at different wavelengths to probe the contribution of various chromophores to the supramolecular structure of the aggregate. We find that the perylene core distorts upon aggregation, where the bonds along the perylene long N-N axis lengthen and the ones perpendicular to that shorten, suggesting a head-to-tail arrangement due to H-bonding between neighboring units.

Important to optoelectronics applications is also the excited state evolution following photoexcitation, especially when structural methods are employed to decipher the exact species that are formed upon excitation of π -conjugated oligomers and polymers. We have applied Femtosecond Stimulated Raman Spectroscopy (FSRS) as a tool to investigate the ultrafast dynamics of a series of oligofluorene compounds with the goal of understanding the vibrational mode-specific dynamics that are associated with the early time relaxation of the electronic excited states, and how these depend on oligomer chain length.

A variant of the FSRS technique, inverse/stimulated Raman spectroscopy, employing nanosecond pulses and photonic fibers, has also been initiated within this thesis to be applied in the case of very fluorescent samples, such as the PBIs molecules, and for all-optical switching in organic materials.