Group: Laboratory of Organic Chemistry/Nanoscale Microscopy and Spectroscopy Group
Project: **Tau Protein Condensation in disease**
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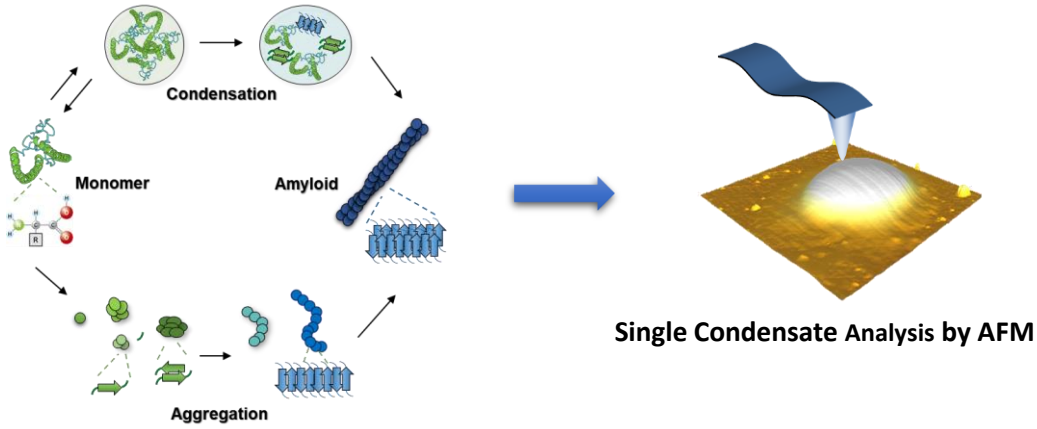
Introduction: Proteins undergoing liquid–liquid phase separation (LLPS) form biomolecular condensates critical for cellular function and living organisms. However, LLPS is also implicated in human pathologies, especially protein misfolding diseases, where abnormal phase transitions lead to disease-associated aggregates. Understanding the molecular factors driving these transitions is challenging. In this context LLPS of the Tau protein, linked to neurodegenerative diseases like Alzheimer's disease is a key area of interest. However, this phenomenon happens at the nanoscale and yet requires advanced investigation. Atomic Force Microscopy (AFM) based techniques allow to image at the single condensate level the mechanisms of protein condensation and the properties of these protein self-assemblies.

Keywords: Liquid-Liquid Phase Separation, Condensates, Alzheimer's Disease, Optical Microscopy, Nanoscale Imaging, Vibrational Spectroscopy



Aim

- Elucidate the properties and formation of protein condensates in health vs. disease states.

Objective

- Utilize optical microscopy to characterize Tau droplets
- Unravel at the nanoscale properties of Tau condensates by AFM based techniques.
- Unravel by infrared spectroscopy the stability of the condensates

What will you learn

- ✓ Preparation of liquid liquid phase separated tau droplets and optically characterize them.
- ✓ Acquire and Analysis of Spectroscopy data
- ✓ Nanoscale imaging using AFM
- ✓ Quantitative analysis of AFM data

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