GRK 2670 BEAM PHIPHILICITY YOND

BEAM Conference 2025

19–21 March 2025|Halle (Saale), Germany

Dynamic Yet Defined – Self-Assembly of Small Molecules in Solution: Colloid-Like Ionic Clusters (Ionoids).

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During the search for new polymers based on non-covalent molecular forces, a new class of colloidal ionic clusters, known as "ionoids," was discovered in 2012. These structures consist of a multicationic molecular cage, such as the "Texas-sized molecular box", combined with a dianionic salt, such as dipotassium methanedisulfonate or Fremy's salt. Ionoids are spherical, monodisperse structures with a hydrodynamic radius ranging from 6 nm to 8 nm, characterized by remarkable stability. Their self-assembly occurs spontaneously under specific solvent conditions (DMSO:glycerol:water in a 50:43:7 v/v/v ratio) after an incubation period of ten days at room temperature. This self-assembly process results from a combination of factors, including preferential solvation, viscosity, van der Waals interactions, and long-range correlated electrostatic forces. In this work we report the synthesis of "Texas-sized molecular box" and four other macrocycles, through a macrocyclization reaction combining a common heterocyclic head with five different linkers. The initial stages of the ionoids derived from macrocycles and Fremy's salt have been analyzed by means of electron paramagnetic resonance (EPR) spectroscopy. In addition, the properties of the ionoids derived from macrocycles and dipotassium methanedisulfonate (MDS) such as the forces and mechanisms governing their formation and stability have been studied using dynamic light scattering (DLS). The preparation of new linkers, heterocyclic heads, macrocycles, and ionoids is underway. Stay tuned for further results!

Poster Presentation