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SELF - ASSEMBLY PERSPECTIVES OF MELAMINE AND CYANURIC ACID

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Melamine and cyanuric acid are chemicals to be studied for formation of supramolecular structures. They have a certain interest to expand the number of using structures for practical application. In our research we use a reaction-diffusion system with modified and unmodified components for click - chemistry and biomolecules encapsulation-release.

Hydrogen bonds play a key role in formation of hieratical structures in nature: Watson - Crick bases in DNA or secondary structures of proteins are common examples. This type of bonding is useful for chemists for bottom-up construction of functional materials using self - assembly process (SA). The process involves noncovalent interplay that allows to create reversible macroscale structures of different forms. Melamine (M) and cyanuric acid (CA) are organic molecules and convenient scaffolds to study the process of SA of supramolecular structures.

M and CA are symmetric and have six available positions to form a pattern. Due to these structural features, they organise systems with a variety of shapes: rosettes, linear tapes, crinkled tapes and lattices. Molecule functionalization, study of their assemblies and their practical application are main issues in the field of chemistry. In this work we apply reaction - diffusion (RD) which is a process when components move from different positions and form spatially organised structures. Because of the relative ease of further substitution, we choose cyanuric trichloride to finalise modification with the azide tail. In turn, cyanuric acid modification starts from native form with a product of alkyn substitution. We modify M and CA in the descibed way with a final aim to apply them in click chemistry. To build the RD system we create small agarose - based triangles with native and functionalized compounds. Once reaction - diffusion done with the appearance of microparticles, we examine their morphology characteristics with optical/fluorescent (BF, RHOD, DAPI, FITC) and scanning electron microscopy. In addition, by our experiments we prove a concept of DNA trapping inside native MCA supramolecular structures. We carefully investigated biomolecules encapsulation and find the influence of the presence of magnesium ions on DNA fluorescence profiling inside supramolecular capsules and capsules characteristics by themself.

In this study our group performed a number of work directions upon the supramolecular system. Our results have a large perspective in terms of chemistry in creation of functional materials and medical for controllable release of biomolecules.

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