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STIMULI-RESPONSIVE SUPRAMOLECULAR ASSEMBLIES

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Recently supramolecular assemblies were suggested to be used as detectors due to their stimuli sensitivity. The response of such system depends on a number of parameters including physical and chemical properties and composition of both environment and assemblies. In the present work, responsivenesses of melamine cyanurate and melamine barbiturate water solutions to pH and temperature changes are presented.

These days, there is a pronounced tendency in detecting systems development to increase the velocity of the response to required parameter changes. The new approach is in using stimuli-sensitive supramolecular assemblies due to the nature of it's structure. Supramolecular structures can assemble by only non-covalent interactions such as hydrogen bonding which provides the ability to reversive assemble and disassemble under different input stimulation.

We have studied the dynamics of melamine cyanurate and melamine barbiturate self-assemble in water solutions varying pH and temperature conditions. Temperature changes have an effect mainly on the size of assembled structures. Particularly, we performed a set of experiments under temperatures of supramolecular assembly from 2.5°C to 50°C. The samples were analyzed by scanning electron microscopy. Experimental data about melamine barbiturate confirm that temperature decreasing promotes low-defect crystal growth in contrast to room temperature conditions. In case of melamine cyanuric assembly, the results are surprisingly opposite. The pH-responsiveness of chosen supramolecular assemblies was checked by potentiometric titration method. Several systems with different concentrations of components were studied and we defined the behavior of assemblies in acid, neutral and basic conditions. The obtained crystals were analyzed by scanning electron microscopy and infra-red spectroscopy. It was shown that studied systems are stable at the same range of pH (). Especially strong difference is in case of extremely acidity range. Equilibrium constants were calculated for both systems in presence of different background electrolytes such as NaCl and KCl. Concentrations of electrolytes were varied and the changes in equilibrium constants were also observed.

In conclusion, melamine cyanurate and melamine barbiturate assemblies are characterized by stable conformation according to non-covalent interactions in parallel with high responsiveness to pH and temperature changes. Melamine cyanurate and melamine barbiturate show a clear response to input stimuli without disassemble in wide range of pH and temperature. Thus, we present two systems, whose stimuli response can be tuned manually and the future prospects of such systems are very promising.

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