Stimuli-induced transformations in confined systems

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Abstract: It is fascinating how the changes happening at the molecular level are the basis of life. Millions of chemical transformations occur in biological systems to keep life going. How would such complex transformations happen effortlessly in biological systems? The answer is confinement and compartmentalization. For example, compartmentalization in cells enhances the efficacy of subcellular processes by concentrating the essential components in a confined space within the cell. Similarly, enzymes—the biocatalysts—confine specific substrates in their binding pockets with the help of non-covalent interactions and accelerate a reaction by reducing the activation energy required for the reaction. Taking inspiration from nature's way of confining molecules, what happens if a chemist chooses to confine molecules in different synthetic confined spaces? This is what I have been investigating throughout my research career. During Ph.D., I worked on the chemical reactions that happen in the crystalline state of a molecule, driven by the molecular packing in the crystal, termed "Topochemical reactions."[1] The work is focussed on designing and organizing bio-monomers in crystal state for their heat-stimulated azide-alkyne cycloaddition polymerization without the need for metal catalysts.[2] In my first postdoc, I worked on the "transformations in the coordination cage/guest inclusion complexes". The work is focussed on the aspects of how i) encapsulation of a suitable guest stimulates the tube-to-capsule transformation of a coordination cage[3] and ii) confining a photoswitch in different coordination containers alters its properties.[4] In this talk, I briefly discuss my Ph.D. and Postdoc research focusing on "*Stimuli-induced transformations in confined systems*", my current research focus and future research aspirations.

References

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