Università degli Studi di Padova

DiSC

Tuesday **3 September 2024** at **14:30** in aula F

Prof. Subhabrata Maiti

Department of Chemical Sciences, IISER Mohali, India

will hold a lecture entitled:

Biocolloidal Taxis and Catalysis in a Gradient of (Oligo)nucleotides

Biology used external stimuli to regulate feedback loops and modulate enzymatic reactions within cells both as a function of time and space.1 Therefore, incorporating catalysis along with functions like – adaptability, stimuli responsiveness, dynamic specificity towards certain receptors or reactions and precise spatial and temporal control can make a synthetic system much closer to complex natural processes. To develop such systems, a catalyst must autonomously be relocated in different zone and toggled between on/off state. Importantly, gaining control over this process will be crucial for the development of spatially segregated chemistry to synthesize novel products or complex structures that are not accessible using conventional methods. Herein, we addressed the above-mentioned issue by modulating phoretic behaviour of colloids through temporally altering multivalent interactivity with nucleotides. Importantly, the catalytic property of the colloid can be autonomously controlled in a temporal fashion by the convertible multivalent scaffold around it. Therefore, multivalent interactivity can control both the phoretic motion of the colloid to dictate spatial location and the temporal control over catalytic process. Multivalency mediated interaction coupled with catalysis plays crucial role in regulating several dynamic self-assembly processes inside living systems, like microtubule dynamics, growth and contraction of actin filaments etc. Despite its significance in supramolecular material chemistry to biomedicine, the potential of such systems in modulating colloidal phoresis or motion and catalytic properties and thereby understanding of precise spatial behavior remains unexplored.

Herein, we realize and control previously mentioned life-like behaviours in a synthetic system by tailoring multivalent interactions of adenosine nucleotides and catalytic microbead.2,3 The research results can find applications - in programming the delivery of colloids for chemical processes (e.g. catalysis or drug release) as a function of space and time by switching on or off phoretic activity. Moreover, these active catalysts can function as sensors in far-off places because they don't need any external power sources.

Your presence will be much appreciated

Host
Leonard Prins

The Head of the Department
Stefano Mammi