

# Photoredox C-C Coupling Reactions inside Supramolecular Cavities

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Enzymes act as nano-vessels which can selectively catalyze chemical reactions by confinement and controlled activation of substrates.<sup>[1]</sup> Chemists have designed supramolecular cavities to mimic enzymes and demonstrated selective product formation.<sup>[2]</sup> Recently it was shown that the photoactivation of weakly polarized  $sp^3$  C-H bonds in water can be selectively done using water-soluble octahedral  $Pd_6L_4^{12+}$  nano-cage.<sup>[3]</sup> However, these cages sometime suffer from low catalytic turnover due to product trapping inside the nano-cages<sup>[4]</sup> so to solve this issue we have tried photocatalysis via charge transfer mediated pathways inside a square pyramidal  $Pd_6L_4^{12+}$  nano-bowl<sup>[5]</sup>. In this seminar, I will discuss our efforts to address two major challenging questions of organic synthetic community, first weakly polarized C-H bond activation and second [2+2] cycloaddition reaction between alkynes which is leading to direct generation of stable cyclobutadiene systems for the first time in water using visible light. In continuation I will show that how the tuning of shape of confinement directs different selectivity towards product formation in the photocatalytic inter- and intra-molecular C-C coupling reactions between carbon centres having either  $sp-sp$  or  $sp^3-sp^3$  hybridisation leading to selective C-C bond formation reaction.

In the next project I will discuss the results of photophysical studies done on blue emitting InP/ZnS quantum dots<sup>[6]</sup> where we are looking into possible ways of exciton dissociation like photoinduced electron transfer and Förster resonance energy transfer process in InP/ZnS QD::Methylene blue and InP/ZnS QD::Rhodamine B dye based donor acceptor system using transient absorption spectroscopy.

## References:

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