Crafting Nano Architectures for Photocatalytic Pathways in Organic Synthesis

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Photo-induced transformations have been a focal point of chemical research for many years, but they have recently garnered significant interest. Modern photocatalytic methodologies rely on the transmission of photons to a specific material - a photosensitizer, which can elevate the molecule to its excited state. This energy can then be transferred to other substrates through energy or electron transfer processes. The matching of excited-state energies and redox potentials between the sensitizer and the reactive substrate is crucial for the success of photochemical reactions.[1]

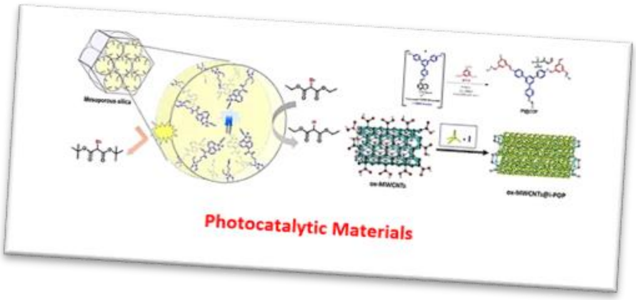

Figure 1. Some photocatalytic materials that will be discussed in the talk.

In this regard, our research group embarked on a new line of investigation several years ago, involving the use of various materials such as mesoporous silicas,[2] carbonaceous materials,[3] COFs[4] for the incorporation of different types of photocatalysts. For instance, we have developed various strategies for attaching photocatalysts to nanotubes, including encapsulation, covalent bonding, and even mechanical attachment. Additionally, in the case of extended organic materials, we have designed specific building blocks containing photocatalysts within their structures or developed new engineering strategies such as monomer truncation [5]. Finally, another robust group of materials for photocatalyst incorporation is mesoporous silica, where we have achieved covalent attachment through an amide linkage. The outcome achieved with each material has significantly relied on the intended application and the appropriate decoration of the material.

References

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