

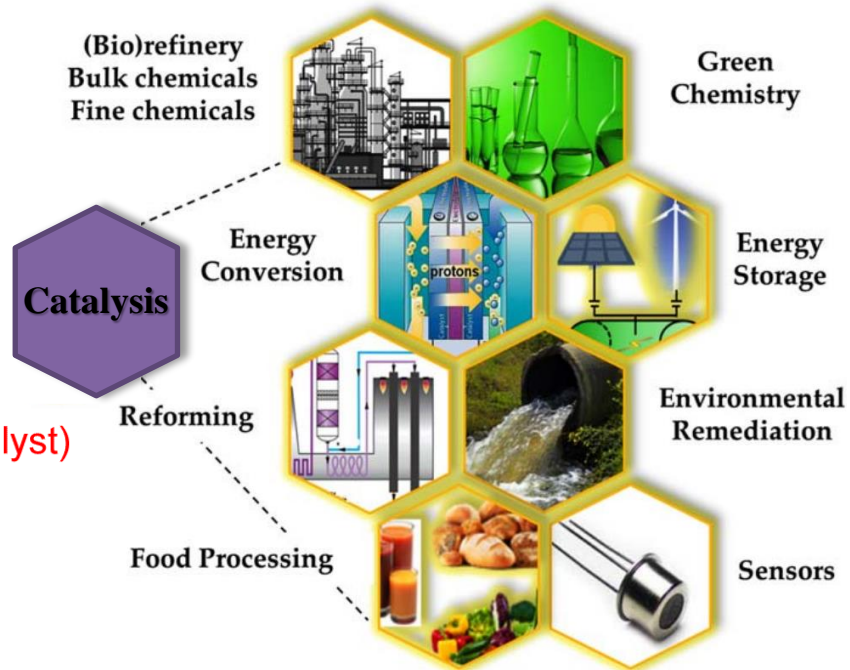
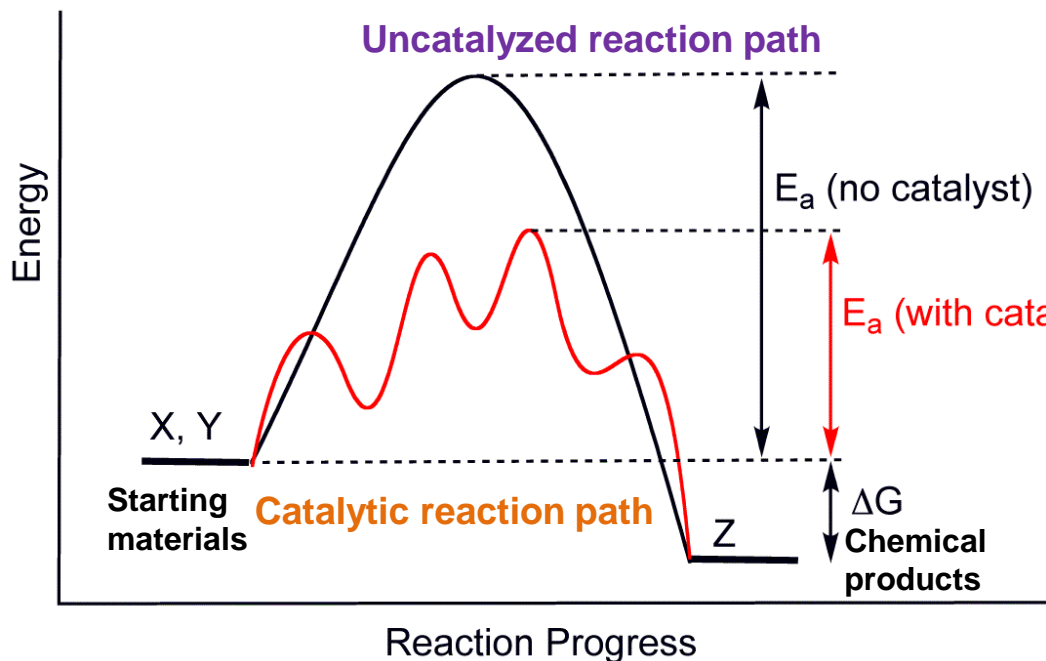


Applications of Soft Matter

Heterogeneous Catalysis

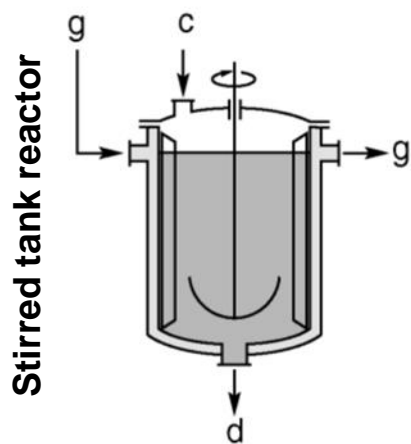
Hao Shen

Heterogeneous Catalysis

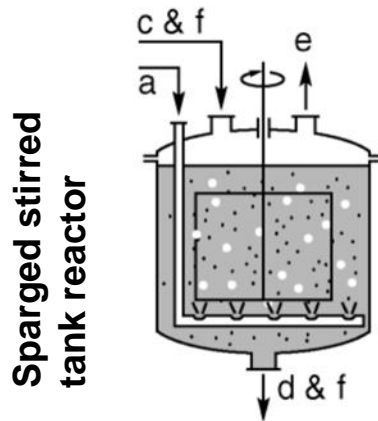


Major applications of catalysis

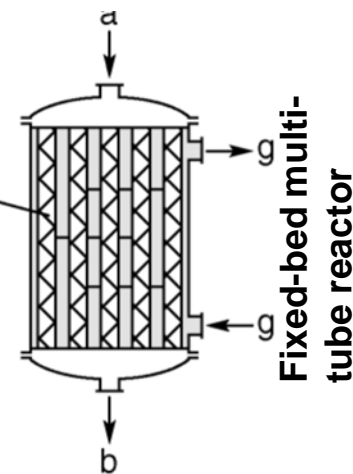
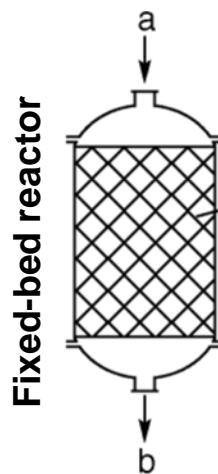
P. Prinsen and R. Luque, *Introduction to Nanocatalysts*, 2019.



Homogeneous catalysis



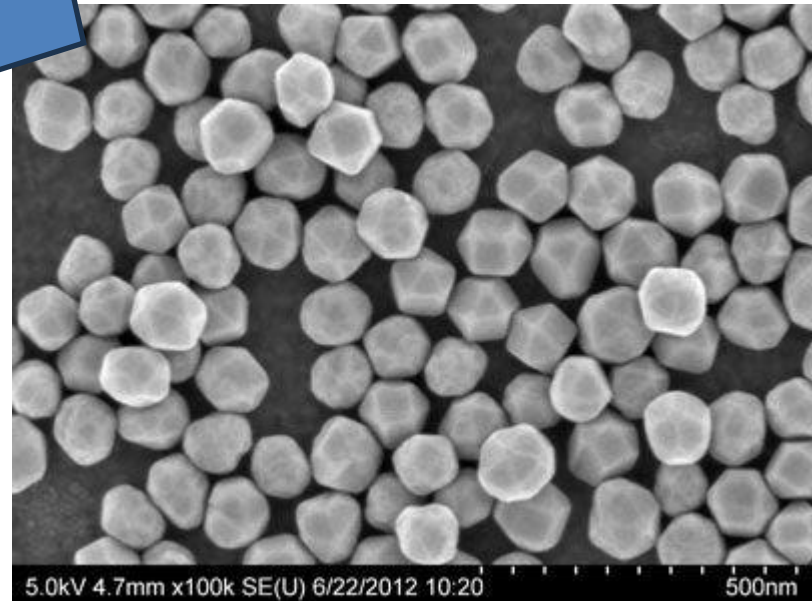
Heterogeneous catalysis



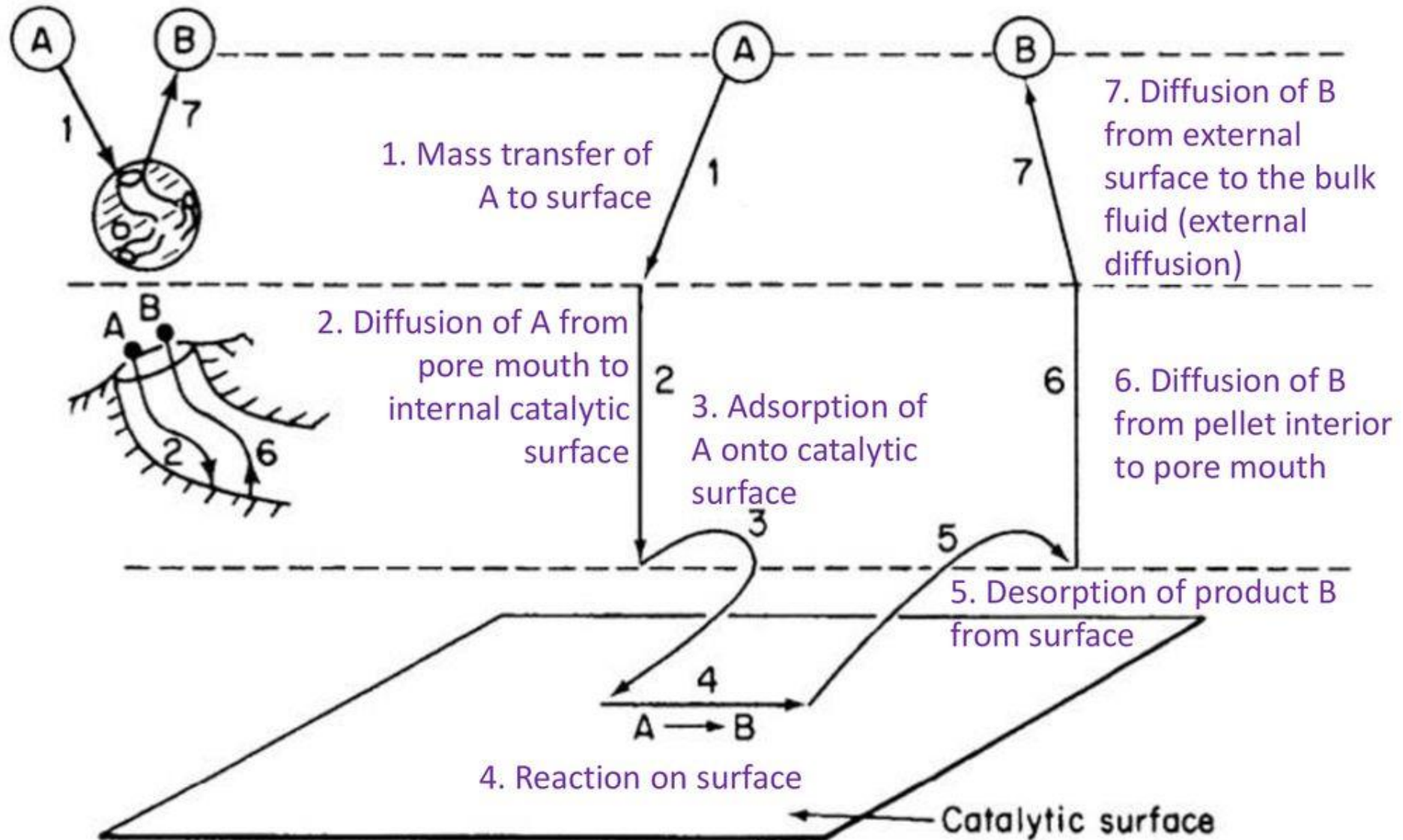


Supported catalysts for industrial applications

Nanocatalysts

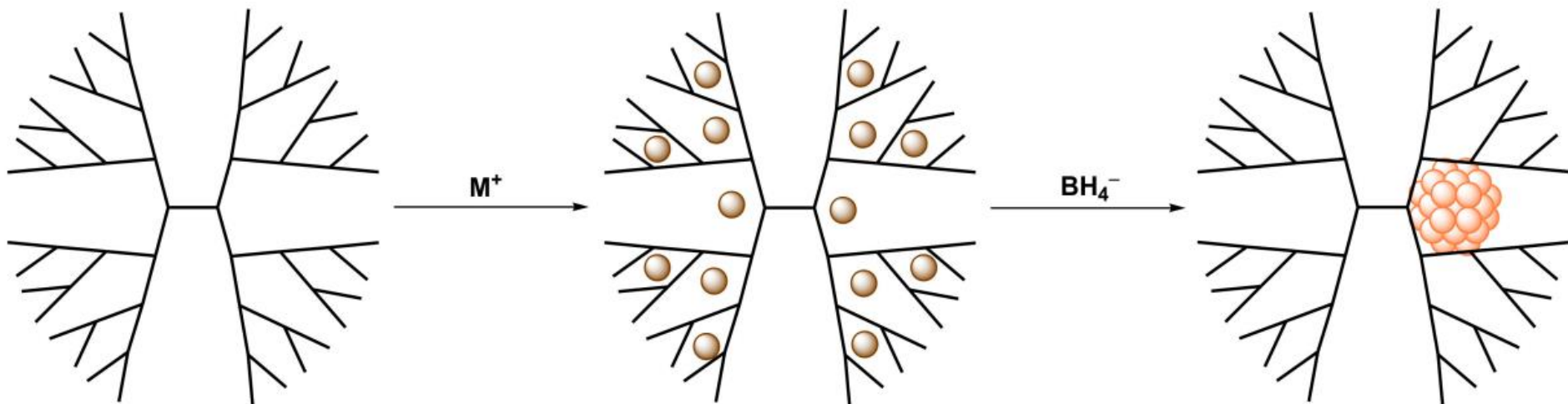


Steps in a Heterogeneous Catalytic Reaction



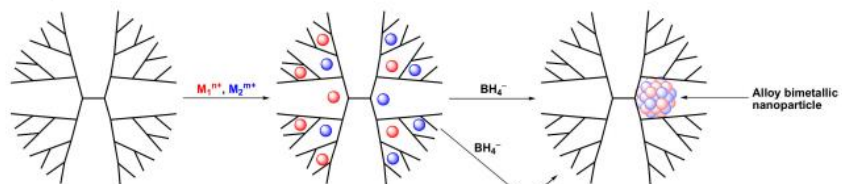
Ch 10 assumes steps 1,2,6 & 7 are fast, so only steps 3, 4, and 5 need to be considered

Dendrimer-Based Catalysts

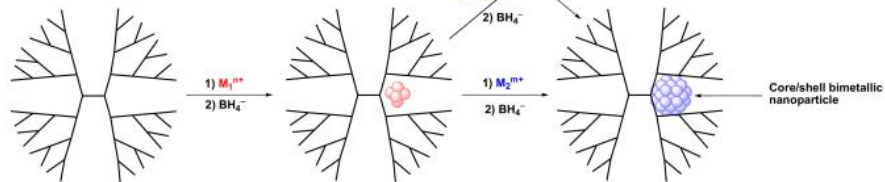


The typical approach for two-step synthesis of dendrimer-encapsulated nanoparticles (DEN).

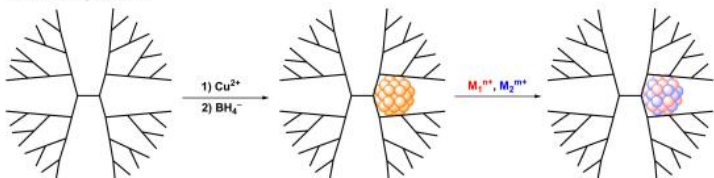
Co-complexation



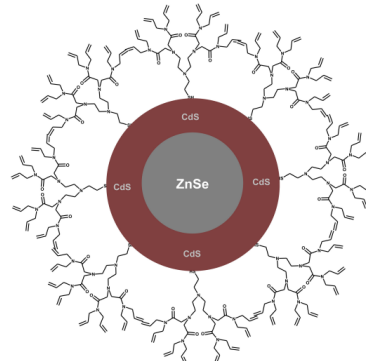
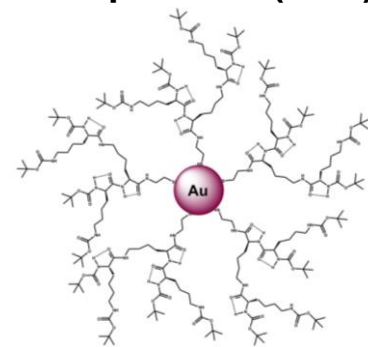
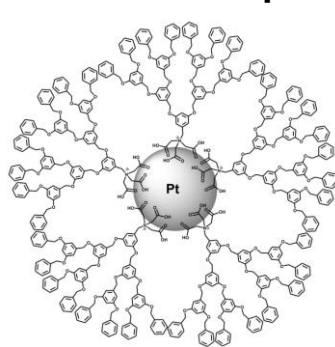
Subsequent complexation



Galvanic displacement

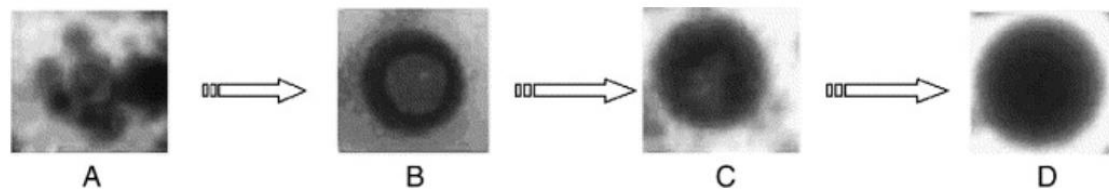
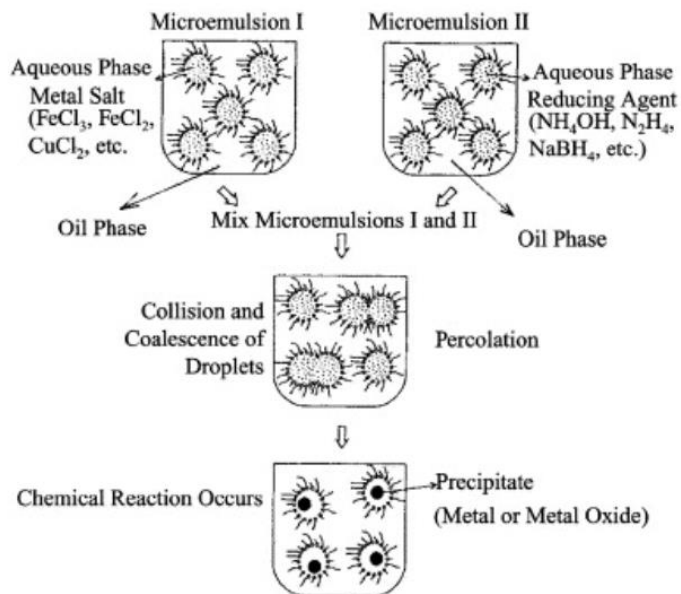


Bimetallic DENs

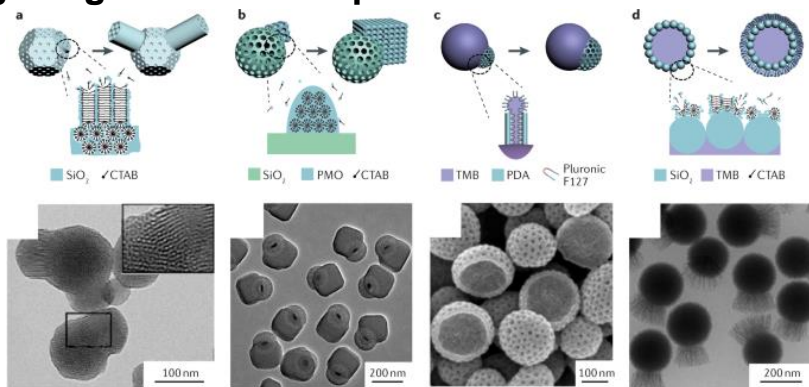


1. Better dispersion
2. Better selectivity
3. Recyclability

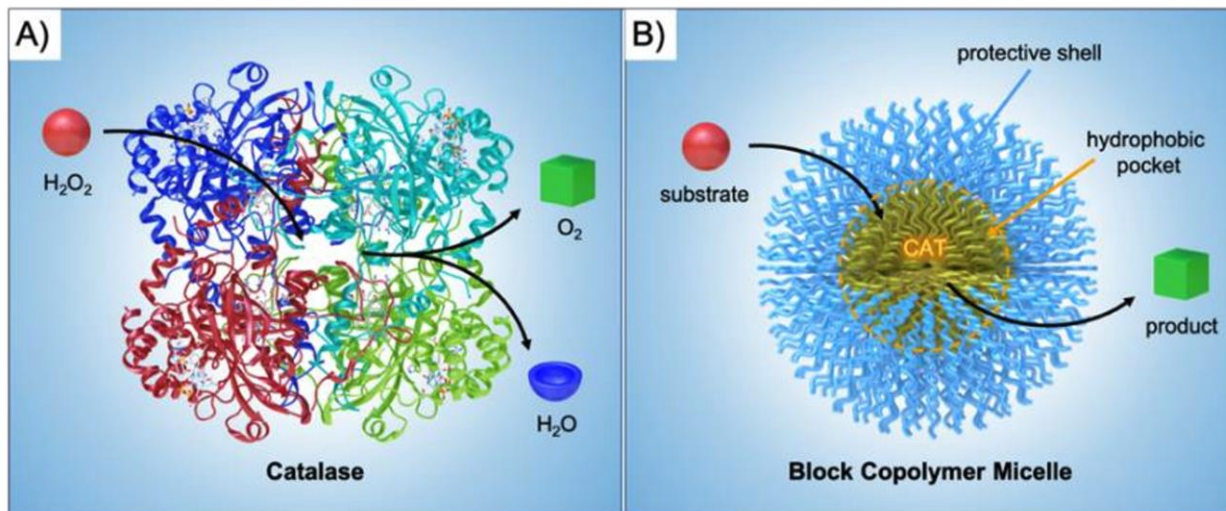
Micelles in Nanocatalysis



Guiding the growth of nanoparticles with well-defined shapes.



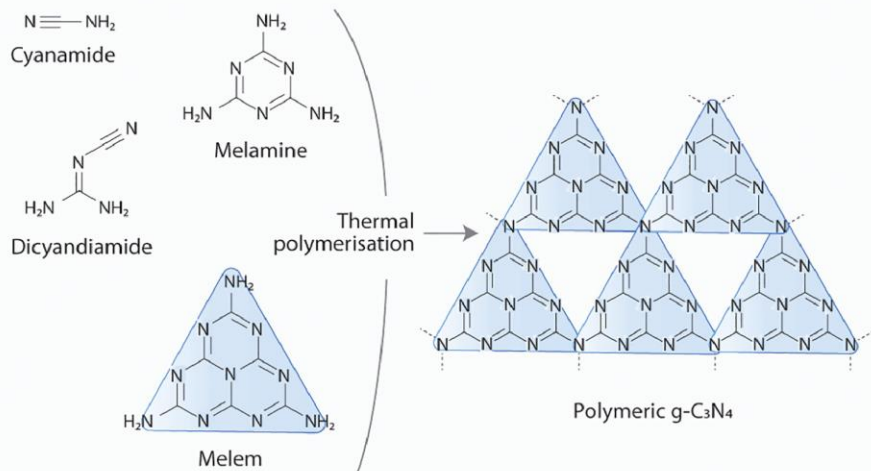
Generate pores for improved mass transport.



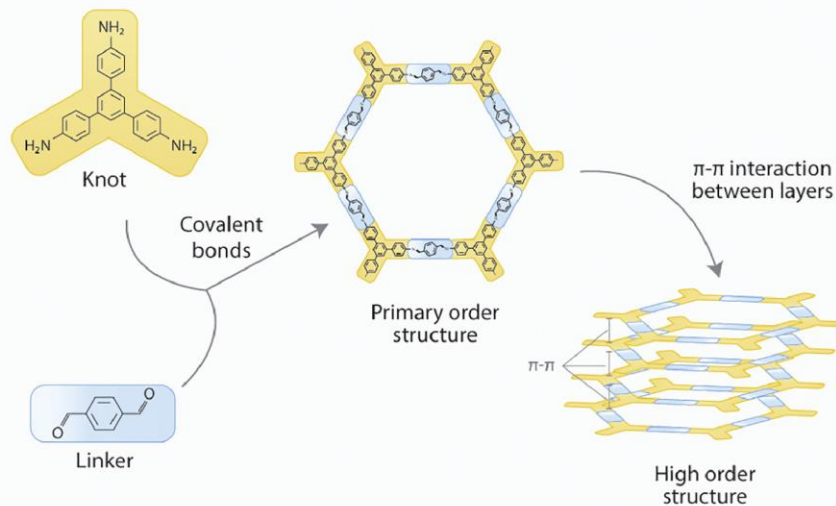
Micelles as nanosized reaction vesicles

Polymers as Catalysts

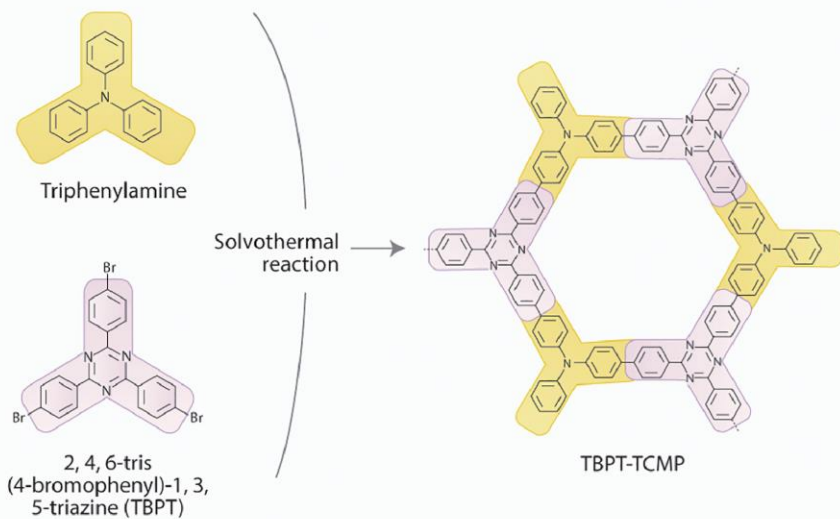
Graphitic Carbon Nitride



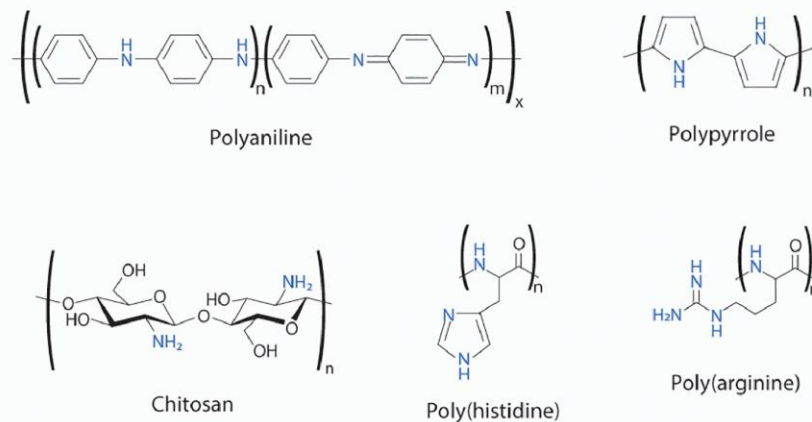
Covalent Organic Frameworks



Conjugated Microporous Polymer

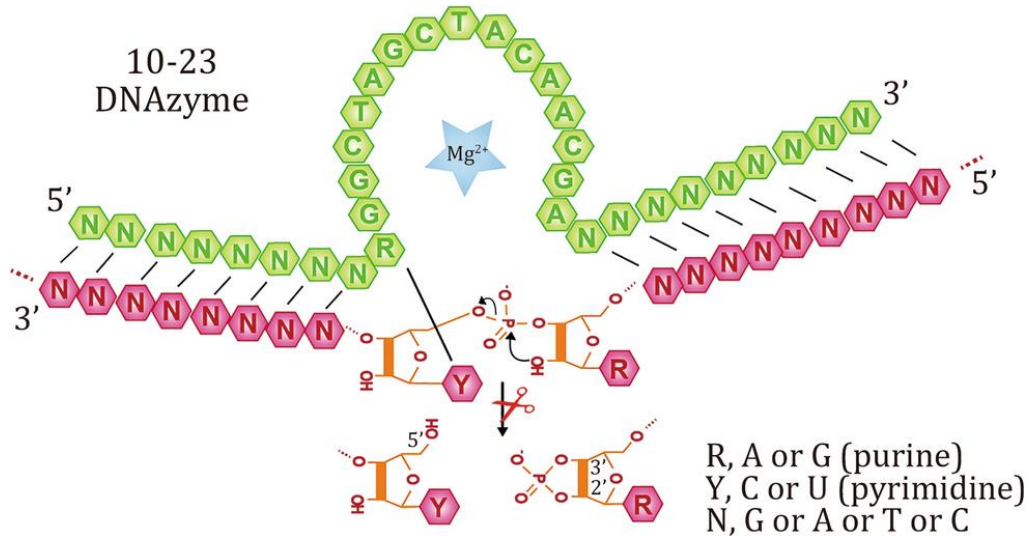


Polymeric Amines

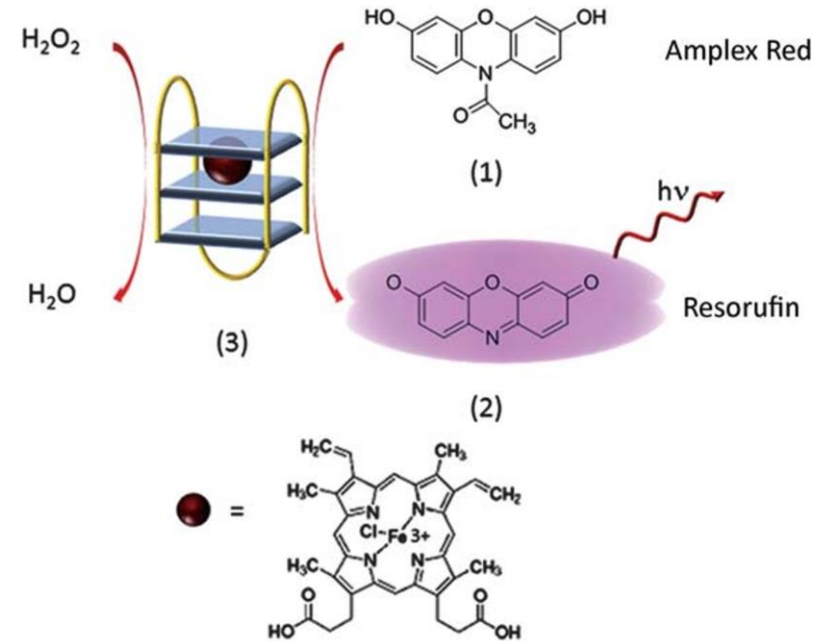


Polymers as Catalysts

DNAzymes

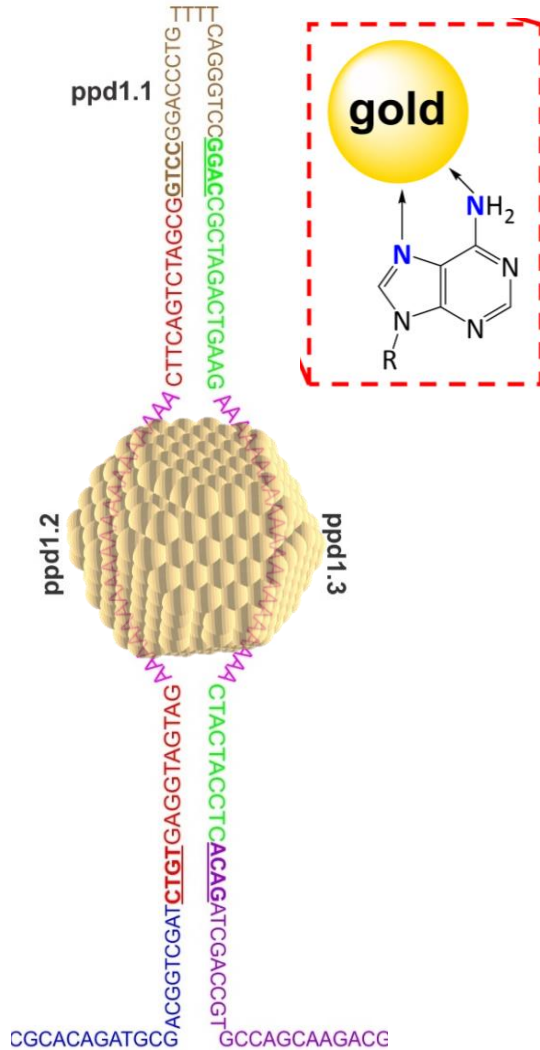


The action mechanism of DNAzyme with RNA-cleaving activity

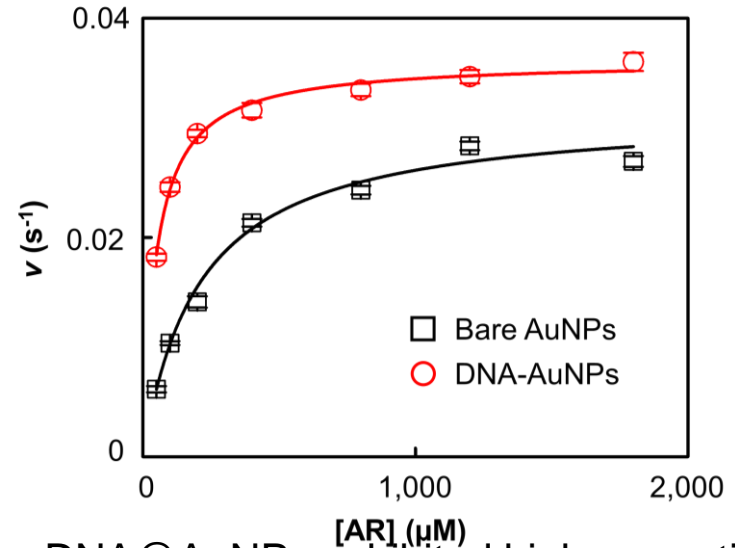


hemin/G-quadruplex DNAzyme mimics a peroxidase.

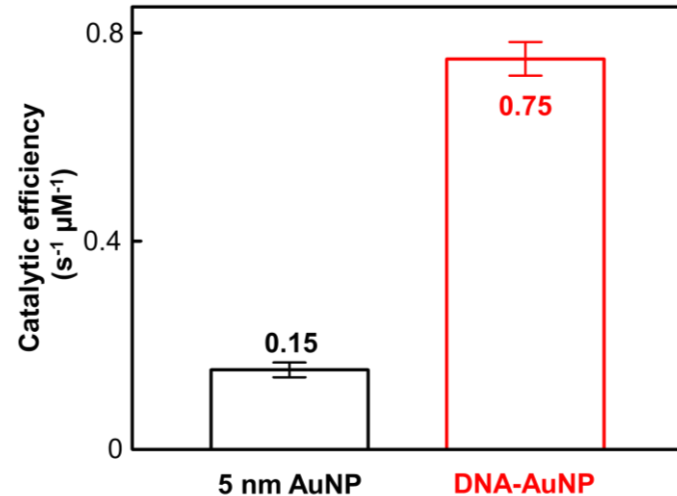
Soft Matter-Nanoparticle Complex



AuNP@DNA design

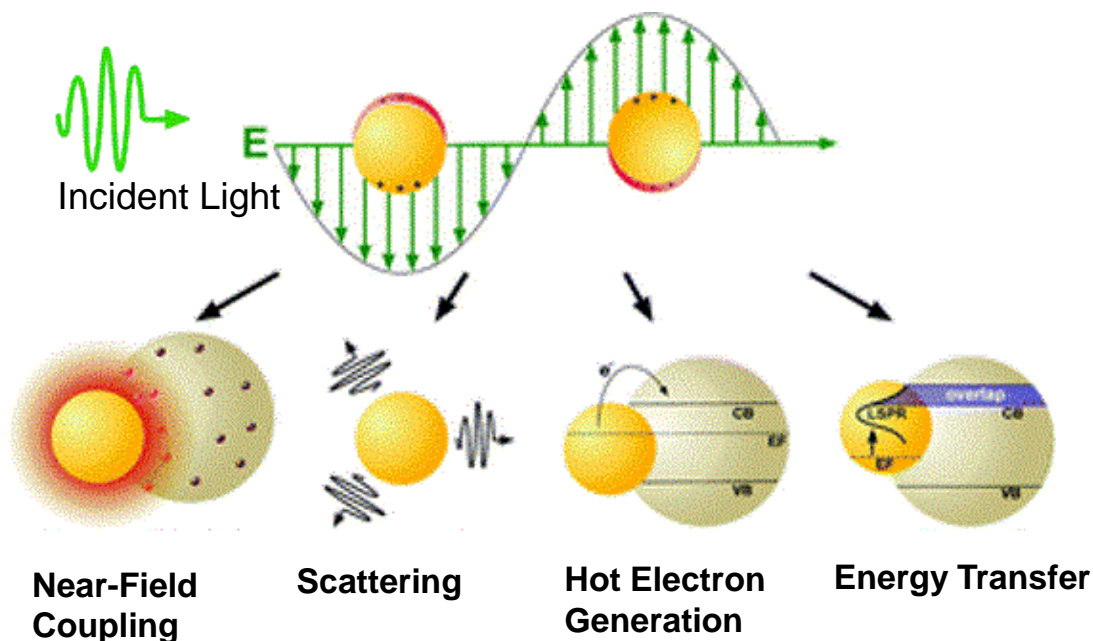


DNA@AuNPs exhibited higher reactivity

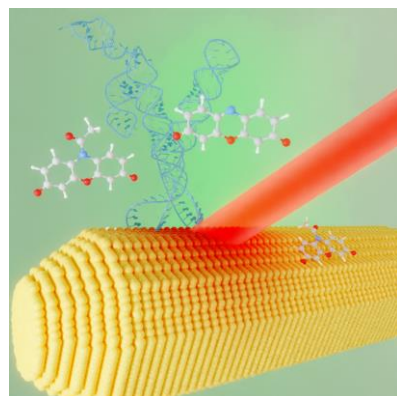
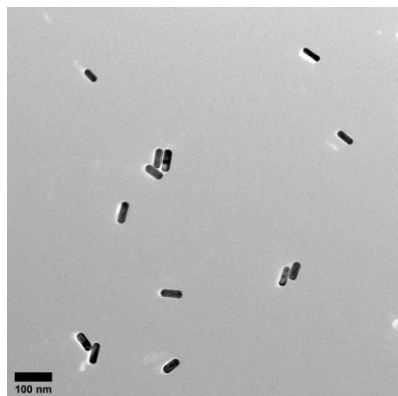


5x higher catalytic efficiency, one of the best peroxidase mimicking nanozyme

AuNR@DNA Coronazyme



Au surface plasmon resonance



Preparation of AuNR@DNA coronazyme

