

Hybrid catalysis and Multi-Copper oxidases

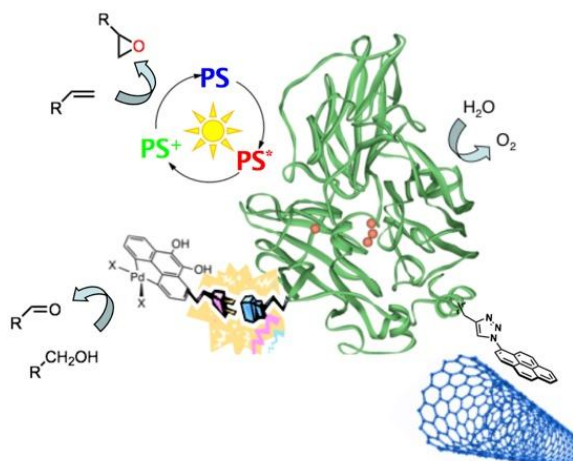
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At the interfaces of chemistry, biology, material sciences and engineering, hybrid catalysis exploits synergies that can appear between different catalysts, e.g. chemo- and bio-catalysts. The combination of catalysts makes it possible both to carry out several stages of transformations and to offer new opportunities in terms of selectivity, efficiency and type of transformations that can be carried out. Understanding the contribution of each partner when associating a synthetic catalyst, an enzyme and a material is necessary to benefit from the best synergy.

Laccases are biocatalysts with great robustness, high oxidation power and substrate versatility.¹ Their unique set of copper centres - a near-surface located mononuclear type 1 and an embedded tri-nuclear cluster (TNC) made of a type 2 and a binuclear type 3 - couple the oxidation of substrates (organic or metal ions) to dioxygen reduction.² We shape new catalysts based in particular on oriented functionalization of a laccase surface with different "plug-ins". From our initial demonstrations on bi-molecular systems - a sensitizer/laccase system coupling the light driven four-electron reduction of dioxygen to water³ to the photo-oxidation of styrene⁴ or a Pd(II)/laccase system competent for the aerobic oxidation of alcohol in mild conditions⁵ - we will present architectures based on the oriented grafting of the enzyme surface.⁶ Our most recent results on improved hybrid photocatalysts and laccase functionalized materials will be discussed.⁷



References

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