Plasmon-assisted photoregeneration of biomolecules.

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Spurred by outstanding optical properties, metallic nanoparticles have attracted much attention in the photocatalysis-based research community. The interaction of metallic nanoparticles with light invokes localized surface plasmon resonance that through fast decay enhances near optical field, generates hot carriers, or rises local temperature, increasing the overall rate of a given chemical reaction.
We present here the use of gold nanoparticles with multiple shapes and surface functionalizations (Pd, Pt) towards the photoregeneration of nicotinamide adenine dinucleotide, an essential biomolecule participating in light processes of natural photosynthesis [1-3]. The nanoparticle-based catalysts were either assembled in the form a plasmonic film on a glass substrate or combined with hydrogel microbeads as well as cellulose fibers, allowing thus their facile handling without altering optical properties. We found out that photocatalytic activities depend not only on the degree of the shape anisotropy but also on the spatial distribution of co-catalyst on the photocatalyst surface. We will also resolve the mechanism of cofactor reduction in the presence of state-of-the-art electron donor molecules – triethanolamine - showing that its degradation products can alter energy flow, leading to a scenario unrelated to the photocatalytic mechanism in question but to the process driven by unexpectedly formed intermediates [4].

References

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