# Efficient Noble-Metal-Free photosensitizers based on BODIPY, perylene monoimide and ketocoumarine dyes

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Our research is centered on innovating the design and application of noble-metal-free photosensitizers such as BODIPYs, perylene monoimides, and ketocoumarins for light driven hydrogen evolution.[1–4]Ketocoumarins provide a simple and straightforward route for synthesis, while exhibiting high extinction coefficients, excellent ISC rates from singlet to triplet state, small singlet-triplet gaps and long triplet lifetimes.[5] In HER experiments with cobaloxime catalyst TONs of up to 3955 were measured with the noble-metal-free system over 20 hours.[4] Close spatial proximity between the catalyst and photosensitizer was achieved with the synthesis of two unimolecular photocatalysts consisting of bipyridine-annulated perylene tetracarboxylic ester bearing platinum or palladium as a metal center. Both complexes exhibited significant catalytic activity in hydrogen evolution catalysis, with the platinum complex achieving TONs of 186 over 48 hours.[1] Additional mercury poisoning experiments revealed the stability of the Pt-photocatalyst during the catalysis, as no reduction in activity was observed, while the palladium complex decomposed during catalysis, forming $Pd^0$ nanoparticles. Furthermore, we will illustrate how the utilization of different macromolecular templates influences the photocatalytic activity of our systems, exemplified by the immobilization of various BODIPY photosensitizers and $[Mo_3S_{13}]^{2-}$ as the HER catalyst within a soft-matter matrix.[3]

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[3] D. Costabel, *et al.*, *ACS applied materials & interfaces* **2023**, *15*, 20833, DOI: 10.1021/acsami.2c18529.
[4] G. Knorr, *et al.*, *J. Mater. Chem. A* **2023**, *11*, 23260, DOI: 10.1039/D3TA04450E.
[5] D. Huang, *et al.*, *Photochem Photobiol Sci* **2013**, *12*, 872, DOI: 10.1039/c3pp25416j.