

Can Polymers do Magic? – The Role(s) of Soft Matter Matrices in Light-Driven Catalysis

Felix H. Schacher¹

¹Friedrich-Schiller-University Jena, Institute of Organic Chemistry and Macromolecular Chemistry, D-07743 Jena, Germany

E-Mail presenting author: felix.schacher@uni-jena.de

Polymers are a versatile class of materials with almost unlimited combinations of functional groups being present in close proximity. This in combination with a widely tunable solubility has enabled quite a range of examples where building blocks for light-driven catalysis (i.e., photosensitizers and catalysts) are immobilized using either covalent anchoring or non-covalent interactions. During recent years, we have developed different soft matter matrices for either light-driven hydrogen evolution (HER) or water oxidation (WOC) based on unimolecular graft copolymers, block copolymer micelles, hydrogels, or nanoporous block copolymer membranes. In all cases, close proximity of the immobilized building blocks facilitated light-driven reactivity, but we also observed additional effects during our studies, such as prolonged lifetime of photosensitizers, altered degradation pathways, or the possibility to repair / exchange catalysts or sensitizers. In addition, some effects imply that – especially in case of polyampholytic graft copolymers – the polymeric matrix is also involved in charge transport, presumably due to the high charge density present along the polymer backbone. Altogether, in this contribution we try to derive some general guidelines for the design of (charged) soft matter matrices for light-driven catalysis.