Supramolecular DNA and metal-complex assembly towards DNA templated photocatalysis

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Over the past few decades, there has been extensive research on various systems, including the utilization of ruthenium and rhodium complexes for artificial photosynthesis.[1] These systems can be intermolecular or intramolecular using either bridging ligands or by embedding them into a polymer matrix.[2] Deoxyribonucleic acid (DNA) has the potential to serve as an ideal model system for such a polymer matrix. It has the advantage of being highly defined, offering the possibility of creating 3D-structures on nano scale.[3] Furthermore, there have been reports of electron transfer between the π-system of the nucleobases.[2,4]

Through absorption, emission and DNA-melting point experiments, we could demonstrate, that Ruthenium phenanthroline complexes with a linked pyrene unit as well as Rhodium-dppz complexes can be intercalated into DNA. Simultaneous intercalation of both complexes leads to quenching of the ruthenium based emission, exceeding quenching in the absence of DNA (cf. figure 1). However, this DNA-templating appeared to hinder photocatalysis of a wide range of substrates. By examining these reactions, we were able to understand the underlying mechanisms and derive valuable insights for future endeavours in this field.

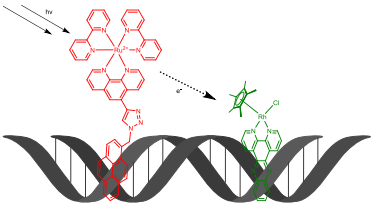

Figure 1: Scheme of the quenching system with a ruthenium complex as photosensitizer and a rhodium complex as quencher, embedded into a DNA double strand.

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