

Abstract

The main focus of this thesis is the light driven reduction of CO₂ using multi-component systems based on non-noble metal complexes. This approach represents a possible future technique to replace fossil fuels and petrochemicals as well in a more environmentally friendly and carbon neutral fashion using sustainable and clean energy sources such as sun-light. Additionally, to avoid amine-based sacrificial electron donors, we investigated the electrocatalytic reduction of CO₂ as well. In this work, systems using an *in situ* generated heteroleptic copper complex as photosensitizer and either iron- or manganese-based complexes as catalysts has been developed for the selective transformation of CO₂ to CO which represents an important building block in chemical industry. Furthermore, several spectroscopic techniques were applied to elucidate the operating principle of the reaction.