Catalytic Transformations at the Interface of Chemistry and Energy: Is Manganese the Better Ruthenium?

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The industrial transformation of carbon-based raw materials into valuable products forms the basis of today’s global economy and modern societies. With its products ranging from energy carriers through plastics and advanced materials to biologically active compounds, chemistry is essential to cope with the global challenges of our time. Moving towards a more sustainable future, there is an increasing need for broadening the raw material basis by developing and using non-fossil resources together with the deployment of carbon-free energy technologies.\textsuperscript{[1]} The present contribution will discuss the opportunities and challenges of this approach and present recent progress in the development of organometallic catalysts for selected transformations.

A special emphasis will be on catalytic hydrogenation of carbon dioxide to C1 building blocks and their use in further synthetic applications.\textsuperscript{[2]} While Ruthenium has been one of the most versatile metals in organometallic catalysts for such reactions, earth abundant and cheap Manganese is emerging recently as a possible alternative.\textsuperscript{[3]} The mechanisms of activation and transfer of the H\textsubscript{2} molecule will be discussed as central molecular process in these applications highlighting similarities and differences between the two metals.

