How can Chemistry and Catalysis contribute to achieve a Sustainable and Carbon-neutral Society?

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The use of renewables, waste, and carbon dioxide for the cost-effective and waste-free synthesis of materials, life science goods and all kinds of organic products can be an important part to achieve a circular economy in the future. In this respect, efficient catalytic reductive transformations of CO_2 offer interesting possibilities to replace existing industrial carbonylations. Nowadays, in the chemical industry, carbonylation processes constitute the largest applications of homogeneous catalysts and many bulk and fine chemicals are produced by such transformations.

In the talk, various possibilities to use green CO from CO_2/H_2 mixtures, formic acid as CO surrogate or directly CO_2 will be shown. Crucial for all these reactions is the development of modern catalysts. By rational design novel ligands and complexes have been synthesized, which allow for unprecedented efficiency in such transformations. Both industrially relevant processes as well as interesting carbonylation reactions for modern organic synthesis will be presented. Furthermore, it will be shown how carbon dioxide itself can contribute to realize CO_2-neutral energy technologies.