Development of Novel Catalytic Systems for the Synthesis of Poly- and Cyclic Carbonates Utilizing Carbon Dioxide

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Introduction
Depletion of petroleum resources provokes the chemical industry to develop new ways to utilize renewable feedstocks. By burning fossil fuels carbon dioxide is emitted to the atmosphere and is considered to contribute as a greenhouse gas to the global climate change. [1] Therefore different strategies in CO₂ management are widely discussed. Besides the reduction of the output of CO₂ the utilization of carbon dioxide as synthetic building block is given great attention in current research. Carbon dioxide is readily availability, cheap and non-toxic. However, the challenge utilizing carbon dioxide is its thermodynamic stability and high oxidation state which requires high energy starting materials. [2] In this context the conversions of CO₂ with epoxides to the corresponding cyclic carbonates or polycarbonates are attractive reactions (Scheme 1). [3]

![Scheme 1. Utilization of CO₂ as C1-building block.](image)

Results
Furthermore the catalysts for these reactions should be very efficient to be applicable in an industrial process. We will present novel efficient bifunctional organocatalysts based on onium salts for the conversion of epoxides with CO₂ to the corresponding carbonates under very mild conditions (2-3 h, 90°C, p(CO₂)= 10 bar). These catalysts are easily recyclable and the desired products are obtained in excellent yields (>90%). Moreover, we will introduce a novel catalytic system for the synthesis of polycarbonates from epoxides and CO₂. Herein a variety of bis-urea derivatives are employed as co-catalysts for the generation of biodegradable polymers with unusual properties. [4]

References