Preparation of silica supported zirconium-based heterogeneous catalysts by surface organometallic chemistry strategy for the conversion of CO$_2$ to cyclic carbonates under mild conditions

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Abstract: Surface organometallic chemistry (SOMC) is a powerful approach to prepare well-defined catalytically active sites on the support surface. In this work, organo-zirconium compounds were prepared and grafted on silica by a facile method. Several materials differing by the podality of the resulting complexes and by the zirconium surface density with zirconium-loading between 0.21 and 0.52%wt on silica which has specific surface area 200 m$^2$g$^{-1}$ were produced. These materials were applied as reusable heterogeneous catalysts to the conversion of CO$_2$ to cyclic organic carbonates displaying high activity and selectivity under mild conditions. The catalysts could be reused several times and the correlation between zirconium leaching and catalytic activity was carefully investigated. This readily available family of catalysts constitutes an excellent candidate for application using impure CO$_2$ as a feedstock.

Keywords: Surface organometallic chemistry; Heterogeneous catalyst; Silica-supported; CO$_2$ conversion