Gas-phase dimethyl carbonate synthesis using novel supported ionic liquid phase (SILP) catalysts

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Dimethyl carbonate (DMC) is an important intermediate in the chemical industry and is used as substitute for toxic phosgene or toxic dimethylsulfate in the production of polycarbonates, isocyanates and urethanes. Furthermore, it can be utilised as non-toxic methylating agent or as solvent for lithium electrolytes in battery technology. It is synthesised via oxidative carbonylation of methanol by carbon monoxide and oxygen in the presence of copper(II) catalysts. We have synthesized novel copper(I) containing ionic liquids of the type $[Cu(Im^6)_2][CuX_2]$ and $[Cu(Im^{12})_2][CuX_2]$ (with X = Cl, Br, Im^6 = 1-hexylimidazole, Im^{12} = 1-dodecylimidazole) that allow the DMC synthesis under mild reaction conditions (120 °C, 4 h, 5 bar O_2, 35 bar CO) in a batch reactor. Based on these promising results we have developed advanced Supported Ionic Liquid Phase (SILP) materials for the gas-phase synthesis of DMC. SILP materials consist of an ionic liquid, dispersed as a thin film on the inner surface of a highly porous solid material. Since the ionic liquid is dispersed on the inner surface of the support, a dry solid material is obtained. The SILP approach allowed the efficient immobilisation of the copper (I) containing ionic liquids as well as the synthesis of DMC under mild conditions of 100 °C and 10 bar reaction pressure.