

Formamides from CO₂ – Catalyst Development for a Continuous Process

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Abstract

The synthesis of formamides was developed using a molecular ruthenium catalyst in a two phasic water-based solvent system (Figure 1). In a first step, *N,N*-dimethylformamide was synthesized in one step from CO₂, hydrogen and dimethylamine.

In a miniplant with a reactor and phase-separation unit, the synthesis was conducted over a period of 240 h. Very low leaching of the stable catalyst was shown and flexible workload for the process was possible.

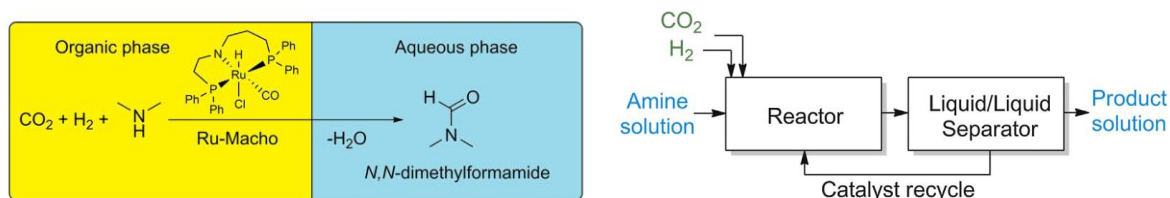


Figure 1: Reactions system (left) and miniplant concept (right) for the DMF-Synthesis

This reaction system was transferred to further amines like aniline or *N*-butylamine. A two stage process is beneficial in this case, in which a formate salt is synthesized first, before in a second step the amine is condensed in a distillation step. In Figure 2, this two-step-process is shown. The yield for the various amines are between 68-89%.

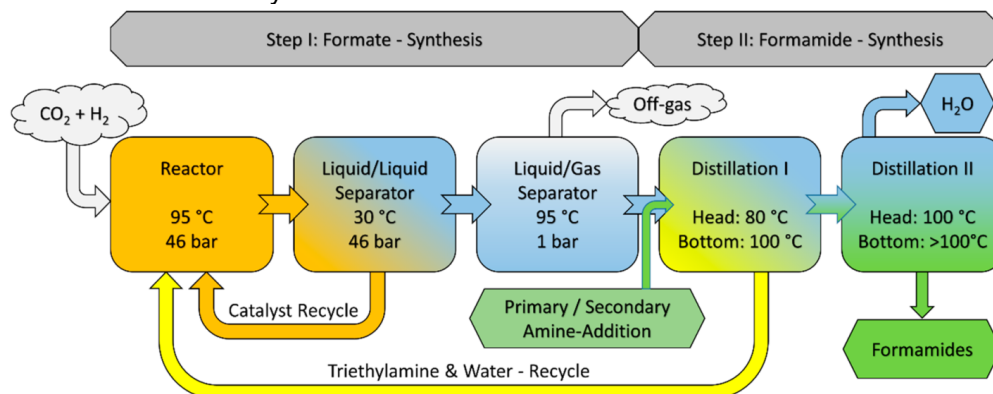


Figure 2: Two Reactions system (left) and miniplant concept (right) for the DMF-Synthesis

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