

Method for producing formamides and formic acid esters

Abstract

- 5 The invention relates to a process for preparing carboxylic acid derivatives of the general formula (Ia)



where

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R is selected from the group consisting of OR^1 and NR^2R^3 , where

R^1 is unsubstituted or at least monosubstituted $\text{C}_1\text{-C}_{15}$ -alkyl, $\text{C}_5\text{-C}_{10}$ -cycloalkyl, $\text{C}_5\text{-C}_{10}$ -heterocyclyl, $\text{C}_5\text{-C}_{10}$ -aryl or $\text{C}_5\text{-C}_{10}$ -heteroaryl,

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where the substituents are selected from the group consisting of $\text{C}_1\text{-C}_{15}$ -alkyl, $\text{C}_1\text{-C}_6$ -alkoxy, $\text{C}_5\text{-C}_{10}$ -cycloalkyl and $\text{C}_5\text{-C}_{10}$ -aryl;

R^2 and R^3 are each, independently of one another, hydrogen, unsubstituted or at least monosubstituted $\text{C}_1\text{-C}_{15}$ -alkyl, $\text{C}_5\text{-C}_{10}$ -cycloalkyl, $\text{C}_5\text{-C}_{10}$ -heterocyclyl, $\text{C}_5\text{-C}_{10}$ -aryl or $\text{C}_5\text{-C}_{10}$ -heteroaryl,

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where the substituents are selected from the group consisting of $\text{C}_1\text{-C}_{15}$ -alkyl, $\text{C}_5\text{-C}_{10}$ -cycloalkyl and $\text{C}_5\text{-C}_{10}$ -aryl

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or

R^2 and R^3 together with the nitrogen atom form a five- or six-membered ring which optionally additionally comprises one or more heteroatoms selected from among O, S and N and bearing the substituent R^4 , where

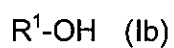
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R^4 is hydrogen or $\text{C}_1\text{-C}_6$ -alkyl;

by reaction of a reaction mixture (Rm) comprising carbon dioxide, hydrogen and an alcohol of the general formula (Ib)

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where R^1 has the above meanings,

or

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an amine of the general formula (1c)



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where R^2 and R^3 each independently have the above meanings, in the presence of a catalyst comprising gold at a pressure in the range from 0.2 to 30 MPa and a temperature in the range from 20 to 200°C in a hydrogenation reactor.

Figure 1