Cu-Ni Alloy Catalyzed Electrochemical Carboxylation of Benzyl Bromide with Carbon Dioxide in Ionic Liquid 1-Butyl-3-methylimidazolium tetrafluoroborate

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A novel, direct and efficient electroreduction method of benzyl bromide in ionic liquid BMIMBF4 has been developed by potentiostatic electrolysis. Under the atmospheric pressure of CO2, the electrosynthesis was performed in an undivided cell with Cu-Ni cathode and Al anode. A moderate yield (39.4%) of ethyl phenylacetate 1 as the principal product was obtained, accompanied astonishingly by yield (4.6%) of benzyl ether 2. Synthetic factors such as electrode material, working potential and electric charge were found to influence the carboxylation yields. The results indicate that the porous structure Cu-Ni alloy electrode with different adsorption energies for CO2 and benzyl bromide played an ensemble effect role in the reaction efficiency and products distribution. Moreover, the ionic liquid was successfully recycled and a plausible reaction mechanism was proposed.

Keywords: Benzyl bromide; Carbon dioxide; Ionic liquid; Electrocarboxylation; Cu-Ni alloy

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