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One-Pot Synthesis of Secondary Aromatic Amines over Supported Copper Catalysts in a Flow Reactor

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One-pot reductive amination of aldehydes with nitroarenes over heterogeneous catalysts using "green" reducing agents is an atom-economical and environmentally attractive method for the synthesis of secondary aromatic amines. Generally, the reaction is realized in the presence of noble metal-based catalysts. However, the high price and limited availability of these precious metals have spurred interest in heterogeneous catalysis utilizing more earth-abundant metal alternatives. Herein, we report the synthesis of functionalized secondary aromatic amines by one-pot reductive amination of aldehydes with nitroarenes over supported copper catalysts using molecular hydrogen as a reducing agent in a continuous flow reactor.

Supported copper catalysts were prepared by impregnaton the support (γ-Al_2O_3, SiO_2, SiO_2 modified by TiO_2) with an aqueous solution of copper(II) nitrate. The investigation of the catalytic properties was performed in an H-Cube Pro™ setup. Before each catalytic run, the catalyst was reduced in a mixture of hydrogen with toluene at T = 120 °C and P =50 bar.

Cu/γ-Al_2O_3 catalyst is effective for one-pot reductive aminationof aliphatic aldehydes with nitroarenes under continuous-flow conditions. Various secondary amines were synthesized with a yield up to 91%. At the same time, copper catalysts supported on SiO_2 and SiO_2-TiO_2 are not capable of securing a high yield of secondary amines. We found that selective adsorption of nitroarene takes place at the catalysts active sites and the hydrogenation of the aldehyde to corresponding alcohol in the presence of nitroarene occurs only after the conversion of the greater part (more than 80%) of nitroarene.

Biography:

E. A. Artiukha is graduate student at Boreskov Institute of Catalysis, Novosibirsk, Russia. Her research focuses on the design of supported Au, Ag and Cu metal catalysts for one-pot synthesis of secondary amines by reductive amination of aldehydes with nitroarenes in a continuous flow reactor. In this scientific field, 4 articles have been published.