Acetic Acid Formation by Selective Aerobic Oxidation of Aqueous Ethanol over Heterogeneous Ruthenium Catalysts - DTU Orbit (25/07/2019)

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Heterogeneous catalyst systems comprising ruthenium hydroxide supported on different carrier materials, titania, alumina, ceria, and spinel (MgAl2O4), were applied in selective aerobic oxidation ethanol to form acetic acid, an important bulk chemical and food ingredient. The catalysts were characterized by X-ray powder diffraction (XRPD), transmission electron microscopy (TEM), energy dispersive spectroscopy (EDS), and nitrogen physisorption and utilized in the oxidation of 2.5–50 wt % aqueous ethanol solutions at elevated temperatures and pressures. The effects of Ru metal loading, pretreatment of catalysts, oxidant pressure, reaction temperature, and substrate concentration were investigated. Quantitative yield of acetic acid was obtained with 1.2 wt % Ru(OH)x/CeO2 under optimized conditions (150 °C, 10 bar O2, 12 h of reaction time, 0.23 mol % Ru to substrate).

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