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Cu/Zn/Zr/Ga Catalyst for Utilisation of Carbon Dioxide to Methanol—Kinetic Equations

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This paper presents the kinetics of methanol synthesis from carbon dioxide and hydrogen over a Cu/Zn/Zr/Ga catalyst. Kinetic studies were carried out in a continuous-flow fixed-bed reactor in a temperature range from 433 to 513 K, pressures from 3 to 8 MPa, and GHSV from 1660 to 10,000 1/h for initial molar fractions of hydrogen from about 0.48 to 0.70, carbon dioxide from 0.05 to about 0.22, and carbon monoxide from 0 to about 0.07. Significant effects of temperature and the composition of the reaction mixture on the conversion degrees α1 and α2 were found. The Cu/Zn/Zr/Ga catalyst showed good stability over 960 h. XRD and CO2TPD characterisation were performed. Thefinally obtained results of kinetic tests were developed in the form of Langmuir–Hinshelwood kinetic equations. The numerical Levenberg–Marquardt method was used to estimate the kinetic equations. The average relative error of fitting the kinetic equations to the experimental data was 18%.

Metryczka

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