A simple kinetic model for oxidative coupling of methane over La0.6Sr0.4Co0.8Fe0.2O3-δ nanocatalyst

A simplified kinetic model for the oxidative coupling of methane over a La0.6Sr0.4Co0.8Fe0.2O3−δ nanocatalyst is presented. The kinetic model was developed by experimental data in a catalytic micro-reactor covering a wide range of reaction conditions (0.04<PO2<0.15 atm, 0.2<PCH4<0.85 atm, 800<T<900 ◦C). Power law rate expressions were used for all reactions. The reaction scheme proposed in this work includes the most important reactions of oxidative coupling of methane and those involved in most of the available mechanisms in the literature.

From the experimental data, kinetic parameters, i.e., pre-exponential factors, activation energies and power law exponents, were estimated. The compatibility of model results with experimental data was investigated and the accuracy of the model prediction was evaluated. Rates of methane consumption, C2+ and COx formation, methane conversion, and C2+ selectivity and yield were compared with experimental data using presented kinetics. The kinetic model was also compared with four previous kinetic models in terms of methane conversion.