Kinetics of combined steam and CO_2 reforming with CH_4 on core-shell structured Ni-based catalyst

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The reaction kinetics of combined steam and CO_2 reforming with CH_4 (CSCR) were developed using a core-shell structured Ni/Al2O3 catalyst and using hydrogen-rich byproduct gases with the molar composition of $H_2/CH_4/CO/CO_2$ = 55/27/9/3, which is the general composition of coke-oven gas. The core-shell structured Ni/Al_2O_3 catalyst was prepared by using oxalic acid in an ethanol solvent with 10wt% of Ni on gamma-Al_2O_3. The reaction carried out the following reaction conditions; T = 750 - 900 oC, P = 0.1 MPa, weight hourly space velocity = 180,000 - 450,000 L/kgcat/h, molar ratio of H_2O/CH_4 = 1.0 - 2.0. The developed kinetic models, which were simultaneously combined with CO_2 reforming with CH_4 and steam reforming of CH_4, were well fitted with the experimental results.