Hydrocarbon production of middle distillates range from syngas on the co-precipitated cobalt-based hybrid catalysts

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Fischer-Tropsch synthesis (FTS) reaction for the direct production of middle distillates range hydrocarbons (C5-C22) from syngas derived by the gasification of coal, biomass or waste, or the reforming of natural gas was investigated on cobalt-based catalysts with different promoters such as Ru, Pt, and La. The catalysts were synthesized by co-precipitation method in an aqueous solution containing Co and Al metal precursors (cobalt nitrate and aluminum nitrate with the weight ratio of Co/Al2O3=20/100) and Na2CO3 solution as a precipitating agent at 70oC in a slurry of ZSM-5 (Si/Al=25). The final pH of solution was maintained at around 7 and the precipitate was further aged for 3 h at 70oC followed by calcination at 500oC for 5h. The same procedure was followed for the addition of promoter using the chloride and nitrate precursors. Finally, the ratios of cobalt and promoters (Ru, Pt and La) metal components to that of ZSM-5 in the hybrid catalysts were fixed at 20/30 and 0.3/30 by weight.