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Research Article

Phase-controlled synthesis of thermally stable nitrogen-doped carbon supported iron catalysts for highly efficient Fischer-Tropsch synthesis

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ABSTRACT

Iron-based nanoparticles with uniform and high particle dispersion, which are supported on carbon structures, have been used for various applications. However, their preparation still suffers from complicated synthesis involving multiple steps and from the high price of precursors and solvents. In the present work, a new carbon encapsulated iron-carbide nanoparticle supported on nitrogen-doped porous carbon (Fe_5C_2@C/NPC) structure was introduced. It was made using a simple solid-state reaction with sequential thermal treatments. Fe_5C_2@C/NPC is a highly active and stable catalyst for the high-temperature Fischer-Tropsch synthesis reaction. It showed very high hydrocarbon productivity (4.71 $g_{HC} \cdot g_{cat}^{-1} \cdot h^{-1}$) with high CO conversions (up to 96%).

KEYWORDS

iron-carbide, one-pot synthesis, nitrogen-doped graphene, Fischer-Tropsch synthesis, Mössbauer spectroscopy