Hyperactive Fe_5C_2 Supported on N-doped steam activated rGO/CNT Hybrids for FTS

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The Fe_5C_2@NsrGO/CNT architecture, consisting of activated iron carbide nanoparticles on N-doped srGO sites with CNT branches, could be prepared via a simple microwave irradiation and CO activation process. The hybridization of CNT with graphene has been researched due to large specific surface area, fast mass transfer and mechanical·chemical stability. In addition, the performance has been further improved by nitrogen doping because N-doped can play a vital role in changing in the electron density state and boning configuration.
The unique structure showed very high performance for the HT-FTS reaction under a high GHSV of 210 NL•g_{cat}^{-1} h^{-1} (FTY = 4.4 x $10^{-3}$$mol_{CO}$ g_{Fe}^{-1} s^{-1}, CO conversion = 80.5%, total hydrocarbon productivity = 49.2 x 10-3 g_{HC} g_{Fe}^{-1} s^{-1}). The high catalytic performance was attributed to the hierarchical structure of CNT-branched s-rGO with high surface area and threedimensionally interconnected pores, apt for fast mass transport, and N-doped sites enhancing the catalytic activity. It is anticipated that this approach may be extended to the preparation of other metal or metal carbide@NsrGO/CNT frameworks as productive catalysts.