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Catalytic performances of Co-based catalysts in Fisher-Tropsch synthesis: effect of particle shape and structure

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Fischer-Tropsch synthesis (FTS) allows producing fuels and chemicals from syngas, which can be derived from natural gas, coal, biomass or wastes. Cobalt is the best compromise in low temperature FTS in terms of price, activity, stability, and selectivity to long-chain hydrocarbons [1]. Previous works claimed that Co with a hexagonal-close-packed (Co-*hcp*) structure possesses a higher catalytic activity in comparison to face-centered cubic cobalt (Co-*fcc*) [2]. The development of Co-based catalysts exposing exclusively Co-*hcp* structure is still a challenge in FTS. Recently, Harmel *et al.* have successfully grown cobalt nanowires (NW) exhibiting the *hcp* structure on a Co/Al₂O₃-SiO₂ catalyst [3]. The as-obtained catalysts have shown high stability in FTS in slurry reactor compared to a reference catalyst [3]. In order to manage the strong exothermicity of the FTS reaction, Harmel *et al.* have also used Cu metallic foam as conductive support, on which they have grown Co-*hcp* NW [4]. This catalyst has exhibited outstanding catalytic activity and high stability in fixed bed reactor [4]. The main drawback of metallic foams is their low specific surface area, which largely limits the increase of cobalt loading.

Well-structured carbon-based supports, have both high surface area and thermal conductivity, and can act as a heat dissipating support. This allows a better homogenization of the temperature and prevents local hot spots formation in the catalyst bed [5].

In the present work, carbon nanotubes (CNT) have been used as conductive supports for the synthesis of new catalysts for FTS. Firstly, Co-*fcc* nanoparticles were deposited on the surface of CNT as seeds for cobalt NW growth. Then, Co-*hcp* NW were grown on the surface of Co-*fcc*/CNT. Finally, the performances of the catalysts were evaluated in FTS using a fixed-bed reactor. The impact of Co particle shape and structure on the catalytic performances will be discussed.

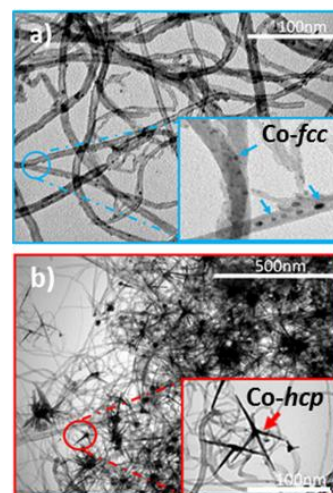


Figure: TEM image of: a) 15%Co-*fcc*/CNT; and b): 7%Co-*hcp*/18%Co-*fcc*/CNT

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