Structural study of carbon nanotube supported catalysts for CO₂ hydrogenation to light olefins
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Abstract: Catalytic hydrogenation of CO₂ to hydrocarbons is the process that converts CO₂ into value-added products such as alcohols, olefins and long-chain hydrocarbons. CO₂ hydrogenation occurs in two consecutive steps: the reverse water gas shift (RWGS) and the Fischer–Tropsch Synthesis (FTS) reactions. FTS reaction is a well-established industrial process, in which the synthesis gas (CO + H₂) is converted into long-chain hydrocarbons through hydrogenation and polymerization reactions. The heterogeneous catalyst plays an important role in controlling the product distribution. The present work is dedicated to understand and improve the activity and selectivity of iron catalysts for CO₂ hydrogenation. The effects of nitrogen-doped carbon nanotubes (NCNT) support and K, Mn promoters on the hydrogenation of CO₂ to olefins have been investigated over Fe catalysts. It is obvious that the addition of promoters could have an influence on the structure of Fe catalyst and NCNT support to become active for CO₂ hydrogenation reaction. The atomic scale structural variation of Fe catalyst, NCNT support and metal promoters has been carefully examined by XRD, XAS and XPS techniques. The interaction between supports, promoters and catalyst has been intensively studied to further understand the fundamental relationship between the structural and catalytic properties of catalysts.

Keywords: Fe catalyst; Carbon nanotube; CO₂ hydrogenation; XAS; XPS