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Fischer-Tropsch process giving motor fuels of higher olefin concn. - by using cobalt-based catalyst, opt. thorium promoted with molybdenum or tungsten as additive

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Synthesis gas is converted to 5C+ hydrocarbons useful as liq. motor fuels by contacting with a Fischer-Tropsch catalyst comprising:
(a) Co,
(b) opt. Th as promoter, and
(c) Mo and.or W as additive, the concn. of (c) being about 1-50 mol. % of (a+c).

USE/ADVANTAGE

Component (c) increases the olefin content of the hydrocarbons obtd., so making the liqs. more suitable as motor fuels and facilitating their upgrading, e.g. by a shape-selective component in the catalyst.

E.g. by deposition of 15 wt. % Mo on the CoO/ThO_2 catalyst component, the olefin content of the gasoline fraction of the prod. was increased from 36.4 to 48.3%, and that of the jet fraction from 31.6 to 43.6%; and the pour point of the diesel fraction was reduced from 50 to 20°F.

PREFERRED CATALYST

There may also be a cocatalyst/support, comprising (d) a steam-stabilised hydrophobic zeolite Y, esp. one in Al extracted form (prepd. e.g. as in US 3591488) in which the Co and the additive (c) are placed largely within the crystallites; and/or (e) a crystalline microporous SAPO silicoaluminophosphate non-zeolite mole sieve (US 4480871), esp. SAPO-11 or SAPO-31.

The concn. of the additive metal is pref. 5-25 wt. %. The Co concn. is pref. 1-25 (esp. 5-15) wt. % if a cocatalyst/support is used, and 1-100 (esp. 5-50) wt. % if it is not used.

PROCESS

The reaction temp. is pref. 150-400 (esp. 240-320)°C.

CATALYST PREPARATION

The Co component (e.g. the carbonate) can be impregnated with a soln. of $Th(NO_3)_4$, and then with a soln. of e.g. ammonium heptamolybdate, and then made up to a mixt. contg. 15% CoO/ThO_2, UHP-Y zeolite and SiO_2 binder, and the mixt. extruded, dried and calcined. Or the Co

component and the additive can be adsorbed within the zeolite crystals.

EXAMPLE

Catalysts comprised (wt. %): (i) (comparative) 15 wt. % (Co + 15 wt. % Th), 70 wt. % UHP-Y zeolite and 15 wt. % SiO_2; and (ii) the same with 15 wt. % deposition of Mo on the CoO/ThO_2 component.

The catalysts were used to convert a 1 : 1 CO/H_2 mixt. at 270°C. 300 psig and GHSV 300. The condensate collected from (i) over 185 hr. and that from (ii) over 426 hr. gave the prod. analyses quoted above (ADVANTAGE).

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