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Fischer-Tropsch catalysts supported on ferrierite - give high conversion of synthesis gas with high yield of paraffin(s) in gasoline range

C83-036250

Mixts. of CO and H₂ are converted to hydrocarbons, using a catalyst comprising one or more metals able to carry out this reaction (pref. Fe, Co or Ru), combined with ferrierite as support. Reaction is pref. at 125-400 (esp. 175-275)°C and a pressure of 1-150 (esp. 5-100) bar.

USE/ADVANTAGE

The conversion of CO and H₂ to hydrocarbons at an acceptable space velocity is improved, e.g. to 46.4% at 1000 NI/l. x h. Selectivity to the valuable C₅-C₁₂ fraction is high, e.g. 59% at the same conditions.

DETAILS

The catalyst pref. contains 0.05-10 wt. % of metals of the Fe series or 0.1-10 wt. % Ru. The Fe series metals are pref. used with promoters, including alkali metals (e.g. K), easily-reduced metals (e.g. Cu), and opt. difficultly reduced metals (e.g. Al or Zn). All metals are introduced

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E(10-J2D) H(4-D, 4-E5, 4-F2E) N(2).

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to the ferrierite by impregnation or pref. ion-exchange with aq. solns. of their salts, followed by washing, drying, calcination and redn. Esp. pref. catalysts include: (a) ferrierite with 0.1-5 wt. % Fe, 0.05-2.5 wt. % Mg, 0.05-2.5 wt. % Cu (as redn. promotor), and 0.1-1.5 wt. % K (as selectivity promotor), which is calcined at 400-500°C and reduced at 250-450°C; and (b) ferrierite with 0.1-5 wt. % Co and 0.05-1 wt. % Cr, which is both calcined and reduced at 300-700°C.

In the feedstock gas, the molar ratio H₂:CO is pref. 0.25-6, and esp. 1.25-2.25. The catalyst may be used as fixed bed, fluidized bed or as a suspension in a hydrocarbon oil.

EXAMPLE

A catalyst was prepd. from ferrierite by exchanging with NH₄ ions using 2n aq. NH₄NO₃, and then with Ru ions using 5 wt. % aq. RuCl₃ for 48 h., then washing, drying, calcination at 300°C for 2 h. under N₂, and redn. with H₂ for 2 h. at 280°C and 4 bar. The prod. comprised (pts. wt.): 1.5 Ru, 49 SiO₂, 1 Al₂O₃.

An equimolar mixt. of H₂ and CO was passed at 1000 NI/l. x h over the catalyst at 260°C and 20 bar. DE3235848

Conversion of this mixt. was 46.4 wt. % giving 106 g. hydrocarbon/g. catalyst x h. The hydrocarbon compsn. (wt. %) was: (C₁ + C₂), 17; (C₃ + C₄), 10; C₅-C₁₂, 59; C₁₃-C₁₉, 10; C₂₀⁺, 4. The condensed hydrocarbons contained 99 wt. % paraffins. (13pp1492).