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23.11.88-US-275252 (30.05.90) B01j-21/06 B01j-23/40 C07c-01/04
C10g-02**Catalyst compsn. for fischer-tropsch conversion . comprising Gp = VIII metal dispersed in titania support incorporating inorganic oxide binder**

C90-072130 R(GB NL)

A catalyst compsn. for the Fischer-Tropsch conversion of synthesis gas to hydrocarbons comprises a Gp.VIII metal dispersed upon a titania support in which there is incorporated 0.1-20 wt.% (w.r.t. wgt. of titania-binder) of an inorganic oxide binder selected from alumina, zirconia and silica.

Prepn. of the catalyst is claimed, as is a process for converting synthesis gas to hydrocarbons at high activity, comprises contacting the admixture of CO and hydrogen, in H₂/CO molar ratio of 0.5:1 or greater, pressure (gauge or indicated) of 80 psig. (551.5 kPa) or more (e.g. 80-600 psig. 551.6-4137 kPa) over the catalyst. Pref. the molar ratio of H₂:CO is 0.5-4:1.

ADVANTAGE

Incorporation of small amts. of the binder into the titania support produces a more porous support and better

dispersion of the catalytic Gp.VIII metal upon the support surface. Activity, selectivity and productivity are increased with lower methane prodn., while the catalyst still has good physical strength.

USE

The catalyst can be used to produce a distillate fuel consisting of linear paraffins and olefins, partic. a C₁₀⁺ distillate, which can be further refined and upgraded to quality fuels and other products such as mogas, diesel fuel and jet fuel, esp. premium middle distillate fuel in the C₁₀ to C₂₀ range.

PREFERRED EMBODIMENT

The titania component has a rutile-anatase wt. ratio of at least 3:2 esp. 3-200:2. The pore volume of the titania-binder is 0.2-0.5 cm³/g. and the surface area is 8-70 m²/g. The inorg. oxide is present in a concn. of 0.5-10%.

The Gp.VIII metal is pref. Co or Ru and is pref. promoted by Re, Hf, Zr, Ce, Th or U.

In a partic. prefd. embodiment, the Gp.VIII metal is Co and the inorg. oxide is alumina.

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The titania-binder is an extrudate prod. in which the titania component has ave. crystallite size below 1000 Å esp. below 600 Å, and ave. particle size below 5 μm esp. below 2 μm.

EXAMPLE

A support was prep'd. from titania and a binder comprising trilobed titania-alumina (61% TiO₂, 39% Al₂O₃) such that the binder concn. was 2% in the extrudate. The titania was mill-mixed with the binder, water and either methocel or polyglycol as lubricant, extruded using a CP-1900 as 1/20 in. trilobes and calcined at 650°C for 50 hrs. The support had pore volume 0.28 cm³/g. and BET surface area 19 m²/g.

The support was impregnated with an acetone soln. of Co nitrate and perrhenic acid, dried (140°C) and calcined (250°C), to provide a catalyst comprising 6.06 wt.% Co, 0.56 wt.% Re and having density 1.24 g/cc. Oxygen chemisorption was performed at 25°C, and the catalyst was employed to convert synthesis gas to hydrocarbon prod., after the catalyst had been first crushed to 60-150 Tyler mesh size and reduced in H at 450°C for 1 hr. Run conditions were 200°C, 280 psig. and the feed comprised 64% H₂, 32% CO and 4% Ne. Space velocity was 1250. Oxygen chemisorption was 0.372 (O/Co ratio), and in

the catalytic test, 85% of the CO was converted, the mole % of methane in the prod. was 4.9, and the ratio of Co productivity (ratio of volumetric productivity to volumetric Co loading) to the chemisorption value (ToN) was 29.3. (17pp1923CGDwgNo0/3).
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