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Hydrocarbon and alcohol prodn. from carbon monoxide and hydrogen - over contact catalyst comprising intermetallic cpds. having first and second phase

D/S:E(BE DE FR GB IT NL).

Synthesis of hydrocarbons and alcohols from CO and H₂ is effected in the presence of a catalyst consisting of a two-phase intermetallic cpd.

The 1st phase is (1) V or Nb, (2) a single phase binary alloy consisting of TiCo, TiCr, TiCu or TiMn or the binary Laves phase cpds. TiCr₂, ZrNi₂, ZrMo₂, ZrFe₂, ZrCo₂, ZrMn₂, TiCo₂, ZrCu₂ or ZrCr₂, or (3) a single-phase ternary or quat. alloy consisting of (a) TiFexMyNz (where M and N are any metal than can substitute for Fe such that the resulting alloy is a single-phase alloy, but not Ni or Ru; x is a no. less than 1; y and z are nos. less than 1 with opt. one but not both being 0, and x + y + z is approx. 1), (b) TiAxMyNz (where A is Co, Cr, Mn or Cu; M and N are any metals that can substitute for Co, Cr, Mn or Cu such that the resulting alloy is a single-phase alloy; x, y and z are such as above) or (c) ternary or higher Laves phase cpds. based on Ti and/or Zr.

E(10-E4E, 10-J2D, 31-A, 31-N5) H(4-E5, 4-F2E) J(4-E1, 4-E4)
 M(26-B, 26-B6, 26-B6C, 26-B6J, 26-B6M, 26-B6N) N(2, 3, 5-A) 0 5 8

The 2nd phase is free Ti hydride or Zr hydride, esp. TiH 1.98.

USE

In addn. to hydrocarbon and alcohol prodn., the process can also be used for CO removal from chemical process streams and for increasing the heating value of gases, e. g. obtd. by the gasification of coal, residua, oil shales, tar sands, etc.

ADVANTAGE

Carbonyl formation risk is negligible. Catalyst activity increases with ageing in H₂.

DETAILS

The catalyst is pref. activated before the synthesis reaction to form free Ti hydride or Zr hydride which is maintained under the synthesis process conditions. The ternary or higher Laves phase cpds. (c) can be (i) TiBxMyNz (where B is Cr or Co; M and N are any metals that can substitute for Cr or Co such that the resulting alloy is a single phase alloy; x is a no. less than 2; y and z are nos. less than 2 with opt. one but not both, being 0; and x + y + z is approx. 2) or (ii) ZrCxMyNz (where C is Ni, Mo, Fe, Co,

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Mn, Cr or Cu; M and N are any metals that can substitute for Ni, Mo, Fe, Co, Mn, Cr or Cu such that the resulting alloy is a single phase alloy, and x, y and z are as above). Pref. the 1st phase is a ternary or quat. alloy having formula $TiFe_xMyN_z$ (where M and N are Co, Cr, Mn, Mo, V and Cu).

The H_2 : CO mole ratio in the synthesis is 2-33 (pref. 10-20); 1.

EXAMPLE

23. 5g granular catalyst having formula Fe 0.7 V 0.2 Ti, particle size 10-80 mesh and surface area $0.15 \text{ m}^2/\text{g}$, were activated by 5 cycles. Each cycle included (i) exposure to H_2 at $300-325^\circ\text{C}$ under 200 psig for 6-12 hrs. and (ii) exposure to H_2 at 20°C at 800 psig for less than 30 min. A gaseous mixt. contg. 4.78 vol. % CO and 95.22 vol. % H_2 was passed continuously over the catalyst at $300-310^\circ\text{C}$ under 380 psig, at $67.34 \text{ standard cm}^3/\text{min}$. 34.54% CO was converted to a prod. mixt. contg. 56.32% CH_4 , 4.56% C_2H_6 , 1.83% C_3H_8 and 37.29% liqs. including alcohols.(20pp200)

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4 Jnl. Ref.