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PHILLIPS PETROLEUM CO

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Conversion of synthesis gas to aliphatic alcohol(s) - using two different catalysts in series to obtain higher (2-8C) alcohol(s)

C88-081725

Synthesis gas is converted to alcohols by:

(a) passing a gas mixt. comprising CO and H₂ through a first catalyst zone (A) comprising:

- (i) Co metal and/or its cpd(s); and
- (ii) MgO and/or ZnO;

(b) passing the effluent from the step (a) through a second catalyst zone (B) comprising:

- (i) Cu metal and/or its oxide(s); and
- (ii) ZnO.

Conditions are such as to obtain a pred. contg. alcohols of at least 2C.

USE

Substantial quantities of 2-8C aliphatic alcohols are obtd. for use as fuel and gasoline additives.

E(10-E4E) H(4-E5, 4-F2E) J(4-E1, 4-E4) N(1-B, 2-B, 2-D), 3-F)

PREF. CATALYST COMPSNS.

Pref. in (A), (i), Co and/or CoO, is 1-5J wt. % of the compsn.; (ii) is MgO. Pref. in (B), wt. ratio (i):(ii) is 3:1 to 1:3. Other materials may be present in the catalysts, esp. a refractory oxide, e.g. alumina, in (B). Wt. ratio (catalyst A):(catalyst B) is 1:1:1 to 8:1.

CATALYST PREPN.

Conventional coprecipitation/calcination methods may be used. (B) is pref. treated with a reducing gas after calcining.

REACTION CONDITIONS

H₂/CO ratio is 1:2 to 4:1. Both steps take place pref. at 250-350°C, 500-1500 psig, GHSV 500-10,000.

EXAMPLE

Catalyst (A), CoO/MgO, contained 33 wt. % Co, 16 wt. % Mg and 3 wt. % Na, and had BET surface area 85 m²/g. Catalyst (B), CuO/ZnO/Al₂O₃, contained 35 wt. % Cu, 35 wt. % Zn and 4 wt. % Al, and had BET surface area 40 m²/g. Wt. ratio (A):(B) was 2.7:1.

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Using 1:1 CO/H₂ at 900 psig, 285°C, GHSV 2600, yield of organic products was 184 mg/g catalyst/hr. Selectivities (wt.%) were: gaseous hydrocarbons 33; methanol 17; 2-GC alcohols 40; 7C+ alcohols 3; esters 1; liquid hydrocarbons 6. Water yield was 35 mg/g catalyst/hr. (6pp1644CGDwgNo070).

US4751248-A