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Novel catalyst consisting of cobalt and thoria on zeolite - of use for conversion of synthesis gas to a high octane hydrocarbon liquid of low aromatic content

C87-053762

E(10-J2D, 31-P2A, 34-E) H(4-E5, 4-F2E) N(6-B, 6-D)

EXAMPLE

A mixture of cobalt and thorium carbonates was precipitated by adding sodium carbonate to a nitrate solution of the metals, filtered off, dried, and crushed to pass 200 mesh. It was then mixed with 4 parts ZSM-5 zeolite of similar particle size, and formed into 0.5cm dia. pellets. The pellets were calcined to convert carbonates to oxides, and then contacted with hydrogen gas at 350 deg.C to reduce the cobalt carbonate to the metal. The catalyst so prepd. contained 8-9 wt. % Co and 1-2 wt. % thoria.

Synthesis gas (1/1H₂/CO) was passed over 60g of the catalyst in a stirred reactor at GHSV 1000, 20 atmos., 280 deg. C. The product included over 60 wt. % C₅+ hydrocarbon liquid, about 89% of which was within the gasoline range and 11% in the diesel fuel range. Research octane number of the liquid was 86, and content of aromatics about 3%. (5pp1644RBH DwgNo0/0).

A novel catalyst (I) consists of :

(a) 75-93 wt. % zeolite having a uniform pore dia. of 5-6 Angstrom, and silica:alumina ratio 25-50, having dispersed thereon,

(b) 6-20 wt. % cobalt, and

(c) 0.5-3 wt. % thoria.

A gas mixture including hydrogen and carbon monoxide is contacted with catalyst (I) at 280 deg.C, 20-30 atmos, to convert a major amt. of the carbon monoxide therein to an aliphatic hydrocarbon product containing less than 10 wt. % aromatics and a major proportion by wt. of C₅ and higher hydrocarbons in the gasoline boiling range with research octane rating more than 80.

ADVANTAGE

The product is a high octane liquid with low aromatic content.

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Gasoline prodn. from synthesis gas - using catalyst comprising cobalt, thorium and zeolite

C83-050195

Prodn. of a hydrocarbon prod. contg. a major amt. of C₅₊ gasoline-range hydrocarbons is carried out by (a) forming a catalyst comprising 6-20% Co and 0.5-3 wt.% ThO₂ and a zeolite with a pore size of 5-6 Å, and (b) contacting the catalyst with an H₂- and CO-contg. gas at 250-300°C and 10-30 atmos.

Catalysts of the above type are also claimed.

ADVANTAGES

Compared with ThO₂/zeolite catalysts, the Co-contg. catalysts give higher yields of gasoline with higher octane no. and lower aromatics content under milder conditions. Compared with Co/zeolite catalysts, they give higher yields of gasoline with higher octane no., lower aromatics content and higher olefin content.

DETAILS

The zeolite is esp. HZSM-5 with a SiO₂/Al₂O₃ ratio of

25-50. The catalyst pref. contains 75-93 wt.% zeolite, 6-14% Co and 0.7-2% ThO₂ and is in the form of 0.3-0.7 cm pellets comprising compacted granules of zeolite and co-pptd. Co/ThO₂ with a dia. of < 80 μ.

The reaction is pref. carried out at 280°C and 20 atmos. with a GHSV of 500-50,000.

EXAMPLE

A catalyst comprising 10-11% Co and 1-2% ThO₂ composited with ZSM-5 was contacted with synthesis gas (CO:H₂ = 1:1) at 280°C and 20 atmos. with a GHSV of 1000. The CO conversion was 78.3%. The prod. comprised 28.2 wt.% CH₄, 10.8% C₂₋₄ and 61.0% C₅₊. The C₅₊ fraction contained 3.0% aromatics and had a RON of 86.0. (15pp367).

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