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Naphtha prodn. from synthesis gas - using non-promoted catalyst comprising iron, zeolite and silica matrix

Conversion of synthesis gas to a naphtha with a 90% b.pt. of < 400°F, with prodn. of methane and ethane restricted to ≤ 30 wt.%, is effected using a catalyst contg. Fe and an acidic zeolite with a SiO_2/Al_2O_3 ratio of ≥ 12, a pore size of > 5A and a constraint index of 1-12. More specifically, the process is characterised in (i) the use of an unpromoted single-particle, fluidised catalyst comprising Fe, zeolite and a siliceous matrix contg. ≤ 30 wt.% Al_2O_3 based on the SiO_2 content of the matrix; (ii) reaction conditions of 500-600°F, 50-1000 psig and a GHSV of 400-20,000 to produce naphtha in an amt. of ≥ 40 wt.% of the total hydrocarbons produced; and (iii) a catalyst prepn. method of adding the zeolite to a siliceous hydrogel (matrix), homogenising, spray drying to produce fluid particles, and impregnating with a water-soluble Fe salt.

ADVANTAGES

The catalysts have high activity, selectivity and stability; the use of multi-particle catalysts is avoided (cf.

H(4-E4, 4-F2E) N(2-A1, 6-A).

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DETAILS

The zeolite is pref. ZSM-5 and is present in an amt. of 5-40 wt.% based on the matrix. The Fe salt is pref. Fe $(NO_3)_3$. The catalyst can also contain a clay weighting agent. The finished catalyst pref. contains 10-20 wt.% Fe (as oxide).

The reaction is pref. effected at 550-580°F and 150-400 psig with a GHSV of 500-6000 and an H_2:CO ratio of 0.5-2:1 (esp. 1:1).

EXAMPLE

A catalyst contg. 13.4% Fe was prepd. by impregnating a combination of 60% hydrogel (54.5% SiO_2, 0.5% Al_2O_3, 1% ZrO_2, 44% clay) and 40% HZSM-5 with Fe $(NO_3)_3$, calcining at 1000°F, and reducing in H_2.

In a synthesis gas conversion test (200 psig, CO/H_2=1:1), the catalyst gave a CO conversion of 30.7 wt.%, and the hydrocarbon product contained 56 wt.% C_{5+} and 26.7 wt.% C_{2-} hydrocarbons.(6pp367).

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