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CHEVRON RESEARCH CO *DE 3440-134-A
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Liquefaction of slurried coal - by non-catalytic hydrogenation with prod. stripping, followed by hydrocracking preserves middle distillate prods.

C85-053682

Process comprises:

(i) slurrying coal with a solvent;

(ii) in a thermal, dissolving/stripping zone, contacting with a first H_2 stream at high temp., with prodn. of a mixt. of solvent, dissolved coal, solids and light prods., and stripping of the latter with the H_2;

(iii) in a hydrocracking zone, contacting the non-vapour prod. from stage (ii) with a second H_2 stream in presence of added catalyst; and

(iv) recovery of a liq. prod. from stage (iii).

USE/ADVANTAGE

Anthracite, lignite or esp. (sub)bituminous coals or their mixts. may be processed. Stripping of the middle distillate fractions in stage (ii) prevents their further hydrogenation with H_2 consumption. Operation of stage (iii) is stabilised; instability of prod. w.r.t. asphaltenes pptn. is reduced; costs of the Chevron Coal Liquefaction Process are reduced.

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SOLVENT

The stage (i) solvent may be a (pref. naphthenic) crude oil, or a fraction (b. pt. above 200 deg. C) or residue thereof. Also pref. as solvent is a recycled process prod. of b. pt. over 205 deg. C.

DISSOLVING/STRIPPING

In stage (ii), the solvent/coal ratio is most pref. 1:1 to 2:1; the temp. is pref. 400-480 (esp. 425-455) deg. C; the pressure 105-350 (esp. 105-175) bar; the H_2 feed rate 14-283 (esp. 14-113) cu, m/barrel feed; the LHSV 0.3-100 (esp. 1-100); and the residence time 0.01-3 (esp. 0.1-1) hr. At least 50 (more esp. at least 90)% of the coal is dissolved; and volatiles, esp. including middle distillates of b. pt. up to 260 deg. C, are stripped out. The reactor is pref. a tower, empty, packed or with bubble caps or valve trays: it ensures countercurrent contacting, with min. backmixing and max. desorption rate.

A vertical continuous stage reactor is pref. used (Perry and Chilton, Chemical Engineers' Handbook, p. 4-21), with temp. decreasing along the flow path. The whole of the residue from stage (ii) may pass to stage (iii), or the solid

may first be removed and recycled to the inlet of stage (ii).

HYDROCRACKING

In stage (iii), the temp. is pref. 340-425 (esp. 340-400) deg. C, and 55-85 below that in stage (ii); the pressure 35-350 (esp. 105-175) bar (the H_2 pressure pref. exceeding that in stage (ii); the H_2 feed rate 56-566 (esp. 85-283) cu. m/barrel, and higher than that in stage (i); and the LHSV 0.1-2.0 (esp. 0.2-0.5).

The feedstock most pref. flows upwards through an essentially fixed catalyst bed, from which fouled catalyst is removed at the bottom while fresh catalyst is added at the top. The liq. prod. has unusually low s.g. and usually less than 0.2% S and less than 0.5% N. Any commercially-available hydrocracking catalyst may be used.(26pp1492MHDwgNo0/1)