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83990 E/40 H04 MONS 12.03.81  
 MONSANTO CO \*EP --61-259  
 13.03.81-US-243273 (+243220) (29.09.82) C01b-03/50 C10g-47  
 C10g-49/22

Hydrocracking process with increased hydrogen utilisation - with recycle of hydrogen-rich stream obtd. by passing vapour from hydrocrackate through polymeric membrane

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

A catalytic hydrocracking process is claimed in which (a) a hydrocarbonaceous feed is hydrocracked in the presence of a catalyst and H<sub>2</sub> at at least 250°C and 45 ata, the reaction zone contg. a vapour phase (I) and a liquid phase and the H<sub>2</sub> being supplied by a feed gas contg.  $\geq 75$  vol.% H<sub>2</sub> in such amounts that the H<sub>2</sub> concn. in (I) is  $\geq 65$  vol.%, (b) the hydrocrackate is sepd. into liquid (II) and vapour (III) phases, (III) being at such a temp. and pressure that it is in equilibrium with (II) and has a greater H<sub>2</sub> concn. than the minimum H<sub>2</sub> concn. of (I), (c) contacting (III) with a polymeric membrane which is selectively permeable to H<sub>2</sub> compared with nitrogen or methane, and (d) withdrawing H<sub>2</sub> permeate from the low-pressure side of the membrane, compressing it and recycling it to the hydrocracking zone.

#### ADVANTAGES

The hydrogen utilisation efficiency is increased without

H(4-B3, 4-E6)

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deleterious effects on the operation of the hydrocracker. Furthermore, the throughput of hydrocarbon feedstock can be increased and the C5+ yield is also increased.

#### DETAILS

The pressure of (III) is pref. at least 0.5 (esp. 0.9-1) times the pressure in the hydrocracking zone. The temp. of (III) is pref.  $< 70^\circ\text{C}$  and (III) pref. contains at  $\geq 75$  vol.% H<sub>2</sub>. At least 5% of (III), and pref. all of it, is contacted with the membrane.

The membrane pref. operates with a pressure difference of  $\geq 20$  atmospheres, and  $\geq 50\%$  of the H<sub>2</sub> in the vapour on the feed side should permeate the membrane.

To produce (III), the hydrocrackate is pref. separated at elevated temp. into vapour and liq. and the vapour is cooled to below  $70^\circ\text{C}$  to form (II) and (III). (26pp909).

(E) ISR:- US3471397; US3733260; FR2265673.