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 METALLGESELLSCHAFT AG *DE 3217-366-A
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 C10k-03

Purifying synthesis gas from coal oxidn. and increasing yield - by sepg. methane by distn. and partial oxidn. to more synthesis gas

C83-110613

A synthesis gas largely free of inerts is made by: (i) gasifying coal with O_2 and water vapour under pressure; (ii) cooling the crude gas; (iii) multistage washing with methanol below $-25^\circ C$; (iv) further cooling by expansion with partial liquefaction; (v) distillation, giving (a) the required CO/H_2 mixt. and (b) CH_4 ; (vi) compression and steam reforming of the methane to another CO/H_2 mixt.; and (vii) addition of the latter to the CO/H_2 mixt. obtd. in stage (v) or to the gas mixt. being passed to a methanol wash for CO_2 removal.

USES/ADVANTAGES

The CO/H_2 mixt. obtd. gives increased yields in the synthesis of alcohols (esp. methanol) and hydrocarbons. The residual gas from synthesis is reduced, e.g. from about 50 vol. % to about 10 vol. %, and its recovery can be much simplified, e.g. by using an oil wash.

H(9-C, 9-D)

DETAILS

Methanol vapour in the gas from stage (iii) is removed using molecular sieves. The CO/H_2 mixt. and the CH_4 from stage (v) are heated by indirect exchange with crude gas and pure gas. The CO/H_2 mixt. is finally compressed for use in synthesis.

EXAMPLE

Gasification of 378 t/h coal with H_2O and 139,000 m^3/h O_2 gives 845,000 m^3/h of a coal gas comprising (vol. %): 25.6 CO_2 , 63.5 ($CO + H_2$), 10.3 CH_4 and 0.6 N_2 . After washing with cold methanol to remove CO_2 and H_2S , the gas comprises (vol. %): 85.3 ($CO + H_2$), 13.9 CH_4 and 0.8 N_2 . After sepg. a CH_4 fraction by distn., 2 pure streams of synthetic gas are obtd.: 10,000 m^3/h at atmospheric pressure and 517,700 m^3/h at pressure. The CH_4 fraction comprises 100,990 m^3/h of (vol. %): 8.8 CO , 86.2 CH_4 , and 5.0 N_2 . This fraction is reformed with steam and 69,040 m^3/h O_2 , giving a prod. comprising 252,400 m^3/h of (vol. %): 94.8 ($CO + H_2$), 3.1 CO_2 , 0.1 CH_4 and 2.0 N_2 . By adding this stream directly to the CO/H_2

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mixt. obtd. earlier or to the mixed gas before CO₂ removal,
780,000 m³/h of a CO/H₂ mixt. is obtd., with a max.
impurity concn. (vol.%) of: 1 CO, 1 CH₄, 1 N₂.
(10pp1492BZDwgNo0/1).