

22319 E/12 H09 PITT-09.09.80
 PITTSBURGH & MIDWAY *EP--47-571
 09.09.80-US-182697 (17.03.82) C10g-01/06
 Controlled short residence time coal liquefaction - providing sufficient liquid yields for solvent balance

H(9-A1)

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The yield of (I) is above 80 (and may be up to 100)% of that needed to maintain an overall solvent balance. If it is below 100%, the balance is made up of (II).

ADVANTAGES

Distillate liquid yields are at least equal to that which would be obtained under the same process conditions but with a total slurry residence time of 0.3-5 hrs. No hydrogenation of the relatively H-depleted recycle solvent is required. The normally solid dissolved coal product has a high (above 50, pref. above 60 %) benzene-solubles content and is therefore relatively amenable to hydrocracking for further solvent or upgraded fuel prodn.

DETAILS

(A) is pref. a tubular zone, suitably in two stages: a first heated and serially connected, second unheated stage. The pref. reaction conditions are 460-490 (esp. about 475)°C, an H₂ pressure of 2000-2500 (esp. about 2000) psig, and a residence time of 0.02-0.15 (esp. 0.06-0.135) hrs. The H₂ feed rate to (A) is 0.5-6 (pref. 1.5-4) wt.% based on the feed slurry, and the H₂ consumption is 0.5-2.5 wt.% based on feed coal.

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

A coal liquefaction process, for the prodn. of a deashed, normally solid dissolved coal product, is operated by passing a slurry of feed coal in a recycle solvent (I) through a preheating-reaction zone (A) at 455-500°C and an H₂ pressure of above 1500 psig with a controlled short (up to 0.2 hrs) residence time, the reaction effluent being immediately quenched to below 425°C to inhibit polymerisation and limit insoluble organic matter yields to below 9 (pref. below 8) wt.% based on feed coal (MF). No hydrogenative reactions take place subsequent to the quenching, and the sepn. of the quenched effluent yields (i) a solvent-boiling-range liquid recycled as (I), and (ii) normally solid dissolved coal in amts. of at least 30 (pref. at least 40) wt.% based on feed coal (MF). A portion of (ii) is catalytically hydrogenated at 370-510 (pref. 400-480)°C and a H₂ pressure of 1000-5000 (pref. 2000-4000) psig to produce a second solvent-boiling-range liquid (II).

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Quenching may be effected before or on the effluent entering the sepn. zone. The quench fluid may be a cool distillate (prefd.) or H₂.

In one embodiment, in addition to the first fraction of the sepn., i.e. the solvent-boiling-range liquid, a portion of the second fraction - a slurry of normally solid dissolved coal, mineral residue and solvent-boiling-range liquid - is also recycled to the liquefaction zone. (51pp920).

(E) ISR: No Search Report.