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Combination coal liquefaction and gasification process - with higher yield of liquid coal products

D/S: E(DT, FR, GB, NL).

A combination coal liquefaction and oxidative gasification process is claimed in which the entire feed to the gasification zone comprises a slurry contg. dissolved coal and suspended mineral residue from the liquefaction effluent, and the H_2 derived from the gasification is consumed in the liquefaction.

Specifically, the process involves passing H_2 and a feed slurry (comprising mineral-contg. coal, recycle solvent, recycle dissolved coal and recycle mineral residue) to the coal liquefaction zone (A) to dissolve hydrocarbonaceous material and hydrocrack it to produce a liquefaction zone effluent (comprising hydrocarbon gases, dissolved liquid coal and suspended mineral residue), recycling to the feed slurry a portion of the dissolved coal, solid dissolved coal and mineral residue, independently recycling to (A) another portion of the solid dissolved coal and mineral residue to produce a greater net yield (on a wt. basis) after recycle of the 450-850°F. dissolved liquid coal compared to the net yield after recycle of the 850°F. + solid dissolved coal, separating dissolved liquid coal and hydrocarbon gases from the non-recycled solid dissolved coal and mineral residue to produce a gasifier feed slurry, passing the slurry to a gasification zone (B) including an oxidation zone to convert the hydrocarbonaceous material to synthesis gas, converting at least part of the synthesis gas to an H_2-rich stream, and passing the H_2-rich stream to (A) to supply all the process H_2 required by the liquefaction step.

H(9-A1, 9-C).

DETAILS

The net yield of 450-850°F. dissolved liquid coal is $\geq$35 (pref. $\geq$50, esp. $\geq$100)% greater than the net yield of 850°F. + solid dissolved coal. The dissolver residence time is $\leq$1.4 (pref. $\leq$1, esp. $\leq$0.5) hrs.

The gasification step is operated such that excess synthesis gas is produced beyond the amt. required to produce H_2 for the liquefaction step; the excess is 5-100% on a heat basis of the total energy requirements of the

combination process. Pref. $\geqslant$ 60 mol.% of the total CO + H_2 content of the excess synthesis gas is burnt as fuel in the system.

The total coke yield in (A) is $\leqslant$ 1 wt.% based on the feed coal. (B) is operated at a max. temp. of 2200-3600°F. (33pp920).

(E) ISR: US3477941; DT2327353; US4050908; US3617465; FR1424090; FR2297239; DT2728537; DT2822487.