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Destroying organic impurities in crude synthesis gas - from moving bed gasification; by mixing with hotter gas from entrained bed gasification

C85-005478

Prodn. of a gas contg. CO and H_2 from a solid carbonaceous fuel comprises:
(i) gasifying the fuel to a mixt. (I) contg. CO, H_2, steam and organic impurities; and
(ii) mixing (I) with a second gas (II) contg. CO and H_2, with a higher temp.

Organic impurities in (I) are destroyed almost completely by reaction with steam. (I) is pref. made by countercurrent moving-bed gasification, e.g. by Lurgi or Lurgi-British Gas processes, and (II) by entrained-bed gasification.

USE/ADVANTAGES

The prod. is useful as synthesis gas, e.g. in Fischer-Tropsch or methanol syntheses.

(I) need not quickly be washed, with heat loss. The mixt. of (I) and (II), in contrast to (I) alone, is hot enough to raise high-grade steam, e.g. in an indirect heat exchanger, which can be used in prodn. of more (I). Cooling of (II) may be sufficient that any slag particles become non-sticky, so that separate cooling-gas injection is not needed.

PROCESS CONDITIONS

(I) is pref. used at 250-700°C and 1-100 bar. Its organic impurities include tar, and their concn. is 50-300g /N m^3 ($CO+H_2$). (II) is used at 1100-1800°C and 1-100 bar. The molar ratio (II)/(I) is 0.2-10.

The mixed stream temp., after endothermic reaction between steam and the impurities in (I) (producing more CO and H_2) is 800-1300°C. The same type of fuel, e.g. coal, can be used to make (I) and (II), larger particles being used for (I), and smaller particles for (II).

EXAMPLE

1 kg coal was gasified in a moving-bed process at 25 bar and 570-1000°C with 0.50 kg O_2 and 2.94 kg steam, to give a gas at 577°C contg. (dry) 38.6 vol.% H_2, 19.8 vol.% CO and 0.03 kg tar. 7 kg coal was gasified in an entrained bed process at 20 bar and 1600-2000°C with 6.30 kg O_2 and 0.56 kg steam, to give a gas at 1602°C contg. (dry) 32.6

vol.% H_2, 65 vol.% CO and 0.000 kg tar/kg coal. On mixing (I) and (II), the gas temp. after reaction was 1227°C. The prod. contained (dry) 35.6 vol.% H_2 and 58.2 vol.% CO, with 0.000 kg tar/kg coal.(14pp1492MHDwgNo0/0).

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