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EXXON RES & ENG CO *US 4888-131-A
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Methane conversion to synthesis gas - using nickel catalyst supported on attrition resistant alpha-alumian to minimis back-reaction on cooling gas prods.

C90-025377

E(31-A1) H(4-E4) N(2-C1)

Process for converting a feed primarily contg. methane to CO and H_2 comprises:

(a) reacting, in a fluid bed reaction zone, the feed with steam and O_2 at at least 1700°F in the presence of a catalyst contg. 0.5-2.5 wt.% Ni on an alpha-alumina support to form a prod. gas comprising CO, H_2 and entrained catalyst;

(b) cooling the prod. gas in a cooling zone to below ca. 1200°F;

(c) maintaining at least 90% of the synthesis gas formed in the reaction zone as CO and H_2 through the cooling zone; and

(d) where the catalyst has a particle density of 2.4-3.9g/cc and is substantially free of silica.

ADVANTAGES

By use of an attrition-resistant catalyst that does not form substantial amts. of fines that can be entrained, the amt. of catalyst carried over to the cooling zone is minimised and so reformation of methane in the cooling zone is minimised. Unconverted methane in the prod. gas is typically below 8%, pref. below 4 mole%.

CATALYST

Particle density is pref. 2.5-3.8, esp. 2.7-3.6 g/cc. The support is pref. at least 95, esp. at least 98 wt.% alpha-alumina. Low levels of silica below 1.5, pref. below 1 wt.% may be tolerated. Particle size is pref. 30-150μ.

PROCESS

Reaction is at 1750-1950, esp. 1800-1850°F and 1-40 atmos. pressure. Pref. CH_4 and O_2 are fed separately to the reaction zone or are diluted iwth steam. The CH_4: steam molar ratio is 1-3, pref. 1.5-2.5, and the O_2:CH_4 molar ratio is 0.2-1.0, pref. 0.4-0.6. Entrained catalyst particles are removed using cyclones. The prod. gas stream is cooled to pref. < 900°F.(11pp1762CGDwgNo0/5).