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Conversion of synthesis gas to aromatic cpds. and liquid natural gas -
 using catalyst mixt. of zinc oxide and aluminosilicate

Mixts. of CO and H₂ are converted to hydrocarbons in contact with a catalytic mixt. of (A) a methanol synthesis catalyst contg. ZnO and Cr₂O₃, with Zn:Cr ratio below 4:1, and (B) a crystalline zeolite component with SiO₂:Al₂O₃ ratio over 12, pore dimensions above 5A and constraint index 1 - 12, made by mixing the components with particle size below 80 mesh and pelleting the mixt. to particles below 10 mesh in size.

USES

Prodn. of aromatic mixts. for use as intermediates, etc.

ADVANTAGES

The catalysts show high activity and selectivity for aromatics and liquid natural gas prodn., with good stability in use. Coke deposition is very low and the carbon can be burnt off to regenerate the catalyst.

PREFERRED PROCESS

E(10-J2B3, 10-J2D) H(4-E5, 4-F2E) N(3-D, 3-F, 6-A).

The catalyst contains 20 - 60 wt.% Al₂O₃, and amount of (B) is less than that of (A). (B) is pref. ZSM - 11, 12, 35, 38 or esp. ZSM-5. Crystal lattice density in the dry H form is pref. not appreciably below 1.6 g/cm³.

Particle size of the components before mixing is pref. around 200 mesh. For use in fluidised bed reaction zones, the mixt. is pelleted to 10 - 30 mesh, while for fixed beds it may be up to 12.7 mm. size. A binder, esp. Al₂O₃, may be incorporated.

Reaction is at 204 - 538° (260 - 482°)C under 1 - 1000 (10 - 300) bar with flow rate 500 - 50000 v./v./1.

EXAMPLE

Catalysts are made by common pptn. of Zn(NO₃)₂ and Cr(NO₃)₃ with NH₃, in presence of Al nitrate or acetate. The ppt. is washed, dried at 100°C, ignited at 538°C overnight, combined with ZSM-5 (H-form) and pelletised to 10 - 30 mesh, the components being of 60 - 80 mesh before mixing. Activation is in a stream of synthesis gas with H₂/CO ratio 1 overnight at 427°C under 84 bar.

Conversion of synthesis gas is under the above conditions, with flow rate 1 WHSV, with results as follows.

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	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Catalyst compsn.				
ZnO wt.	0.03	0.10	0.16	0.27
Cr ₂ O ₃ "	0.52	0.48	0.44	0.41
Al ₂ O ₃ "	0.35	0.32	0.30	0.22
ZSM-5 "	0.10	0.10	0.10	0.10
Conversion %				
CO	66.4	55.9	46.9	41.6
H ₂	26.3	34.7	31.2	23.2
Hydrocarbon Yield %C	37.0	26.6	23.3	17.8
Compsn. wt. %				
Methane	2.1	3.1	3.3	3.4
Ethane	26.5	15.6	15.1	12.6
Ethylene	0.1	0.2	0.2	0.2
Propane	13.2	15.8	15.0	15.6
Butane	6.1	6.6	6.0	5.6
C5 +	10.3	4.4	3.7	4.1
Aromatics	41.7	54.2	56.6	58.4

(43pp195).