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AIR PRODUCTS & CHEM INC \*US 4670-472-A
13.05.86-US-862744 (+US-74)403) (02.06.87) C07c-01/04
Converting syn:gas pref. to 5-25C hydrocarbon(s) using catalyst prepd. by reacting alumina or silica with zirconium, titanium or
hafnium alkoxide, then impregnating with iron or ruthenium
carbonyl
C87-070919

## Cip 4619910

Process for converting syngas preferentially to 5-25C hydrocarbons at CO:H<sub>2</sub> mole ratio 1:1 to 3:1, GHSV 200-1000, 200-350°C and 200-1000 psig is improved by using a catalyst prepd. by: (a) treating an inert, Al<sub>2</sub>O<sub>3</sub> catalyst base with a non-aq. soln. of a Zr, Ti or Hf alkoxide, and removing the non-aq. soln.; (b) impregnating the prod. of step (a) with a non-aq. soln. of Fe or Ru carbonyl, and removing the non-aq. soln.; and (c) exposing the prod. of step (b) to a reducing atmos.; all while maintaining the Al<sub>2</sub>O<sub>3</sub> and prods. under conditions avoiding their hydrolysis, oxidn.

and calcination.

A process as above, except that Al<sub>2</sub>O<sub>3</sub> is replaced by SiO<sub>2</sub>, is also claimed.

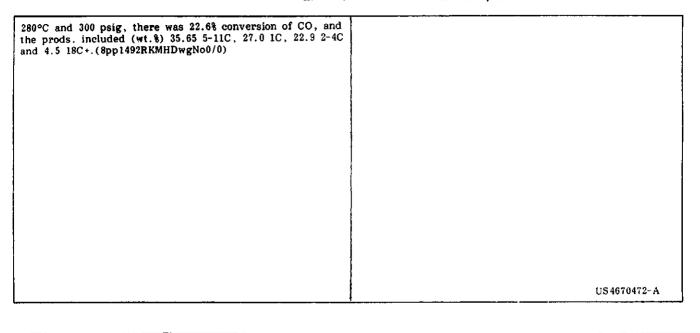
E(10-J2D3) H(4-E5, 4-F2E) N(1-C2, 1-D, 2-A, 2-E, 3-B, 6-E)

## USE/ADVANTAGE

E.g. a Ru/Zr/Al<sub>2</sub>O<sub>3</sub> catalyst showed a selectivity to produce high yields of 5-11C gasoline-range hydrocarbons, with a sharp cutoff at 28-30C, preventing the formation of heavy waxes and so minimising the need for withdrawal of catalyst and slurry from a reactor. A Fe/Zr/Al<sub>2</sub>O<sub>3</sub> catalyst showed a hydrocarbon selectivity centred in the 4-5C range. The selectivity of these catalysts is maintained as a function of time, and the deactivation rate is low. CO-rich syngas, as produced by advanced generation coal gasifiers, can be accepted directly.

## EXAMPLE

 $Zr(OC_3H_7)_4$  was reacted by mixt. with  $Al_2O_3$  in cyclohexane in an inert atmos. until 1 mol. Zr cpd. had deposited by reaction and loss of  $C_3H_7OH$ , per Al-OH gp., and the support was then dried in vacuo. The support was then impregnated in several stages by the incipient wetness technique with  $Ru_3(CO)_{12}$  in soln. in hexane, with  $O_2$  and  $H_2O$  absent, removing unreacted carbonyl and solvent in vacuo after each stage. When the catalyst after redn. was used as a 12wt.% slurry in oil to convert  $CO + H_2$  (1:1) at US = 1



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