

83-747428/35 UNITED TECHNOLOGIES CORP 26.04.82-US-372253 (16.08.83) B01j C10q Catalyst for auto-thermal steam reforming - comprising calcium oxide and rhodium on alumina, deposits less carbon and tolerates sulphur	E36 H04 J04 UNAC 26.04.82 *BE -896-502-A	E(31-A) H(4-C2, 4-F2C) J(4-E4) N(2-E) 004
C83-081770 Catalyst for the autothermal stream reforming of hydrocarbons comprises about 0.01-6 (pref. about 0.5) wt. % Rh on an Al ₂ O ₃ support impregnated with about 10-35 (pref. about 15) wt. % CaO. <u>USE</u> In generating H ₂ , esp. for fuel cells, from S-contg. fuels of b.pt. up to that of gas oil no. 2, including the prods. of coal liquefaction and natural gas. <u>ADVANTAGES</u> Lower O ₂ /fuel ratios can be used without C laydown than with conventional Ni-contg. catalysts. Because of increased activity, the catalyst bed temp. can be lower, and without the usual initial peak. <u>DETAILS</u> The Al ₂ O ₃ used can be commercially available pellets. These can be impregnated with aq. Ca(NO ₃) ₂ soln., and then		dried and calcined in air at about 1010°C. Alternatively, Ca-stabilised Al ₂ O ₃ , enriched with Mg may be used: Mg impregnation is similar to Ca impregnation, except for a calcination temp. of about 982°C. The prod. contains 3-15 (pref. about 5) wt. % Mg. The Rh is pref. mounted on the supports by impregnation with an aq. soln. of Rh nitrate, followed by drying. The fuel, steam and preheated air can be mixed and fed to a cylindrical reactor contg. the catalyst. Oxidn. of part of the catalyst provides the heat required for steam reforming of the remainder. In a pref. form of the process, the first section (e.g. 1/3rd) of the reactor contains Fe oxide or other catalyst tolerant of C at high temp., and the remainder contains the catalyst of the invention. The O ₂ then reacts completely in the first section: this arrangement gives more flexibility w.r.t. max. temp. and the method of adding O ₂ to the reactor. <u>EXAMPLE</u> A catalyst (A) was prepd. from 295g Al ₂ O ₃ pellets by impregnating with an aq. soln. of 552.5g Ca(NO ₃) ₂ .4H ₂ O in 163 ml water, drying, calcining and impregnating 407g of BE-896502-A

the prod. with 233 ml of an aq. soln. contg. 6.5g $\text{Rh}(\text{NO}_3)_3 \cdot 2\text{H}_2\text{O}$, and drying. A comparative commercial catalyst (B) comprised 25 wt.% Ni on alpha- Al_2O_3 . The catalysts were used with a reaction mixt. of air, steam and gas oil no. 2. At 739°C, catalyst (A) could be operated at a ratio O_2/C of 0.35:1, whereas, because of greater C deposition, catalyst (B) required O_2/C ratios of 0.42-0.46. (13pp 1492DwgNo0/4).