

Title (en)
ENRICHMENT OF OXYGEN FOR THE PRODUCTION OF HYDROGEN FROM HYDROCARBONS WITH CO2 CAPTURE

Title (de)
HERSTELLUNG VON WASSERSTOFF AUS KOHLENWASSERSTOFFEN

Title (fr)
PRODUCTION D'HYDROGENE A PARTIR D'HYDROCARBURES

Publication
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Application
EP 03780299 A 20031029

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• FR 0214187 A 20021113

Abstract (en)
[origin: FR2846958A1] The process is carried out at the appropriate high pressures, in particular above 30 bars, to intensify the heat exchanges and/or increase the compactness of the process and/or favour the liquefaction of the carbon dioxide by cooling and/or favour the condensation of the steam by cooling and/or improve the total yield. (a) A flow of pure or nearly pure oxygen is used to oxidise part of the hydrocarbons and steam is used to carry heat to convert the rest of the hydrocarbons at the appropriate temperatures to hydrogen, carbon monoxide and carbon dioxide, in a way that the hydrogen yield is raised. The mixture of hydrogen, carbon monoxide, carbon dioxide and excess steam is called the conversion products below. (b) The hydrocarbons, the oxygen flow and the steam are preheated and are called the reactants. (c) The conversion products are cooled to recover a fraction of the heat energy to preheat the reactants and to condense at least part of the steam. (d) the hydrogen is valued either by consuming the hydrogen contained in the conversion products or by extracting the hydrogen from the conversion products for consumption or storage to be consumed later. An additional stage (e) is a final conversion of the carbon monoxide to carbon dioxide so the residual flow contains only carbon dioxide and uncondensed steam. The carbon dioxide is liquefied and stored in liquid form. A membrane permeable selectively to hydrogen is used to extract the hydrogen from the conversion products, so the partial pressure is lowered downstream of the membrane to dilute the permeated hydrogen flow in an extraction steam flow to encourage the permeation of hydrogen. The extraction of hydrogen takes place at the same time as the final conversion stage, since as the partial pressure of hydrogen is lowered this is favourable to the conversion of carbon monoxide to carbon dioxide. The final conversion is controlled by adjusting the flow and/or temperature of the extraction steam flow. The hydrogen is used to supply a fuel burner operating with air, and the combustion products and/or final products and/or hydrogen are expanded while compressing the air required to operate the fuel burner. The process can also be coupled with a process producing hydrogen and a flow of oxygen (such as electrolysis) or with a process producing nitrogen and a flow of oxygen, to limit the cost of oxygen used in the process. Also claimed is a device to carry out the above process, containing a conversion reactor, means of preheating, a heat exchanger, a condenser and means of using the hydrogen produced, all operating at high pressures, preferably above 30 bars.

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