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(54) Title: A PROCESS AND REACTOR FOR CONVERTING CARBON DIOXIDE INTO CARBON MONOXIDE, INVOLVING A CATALYST

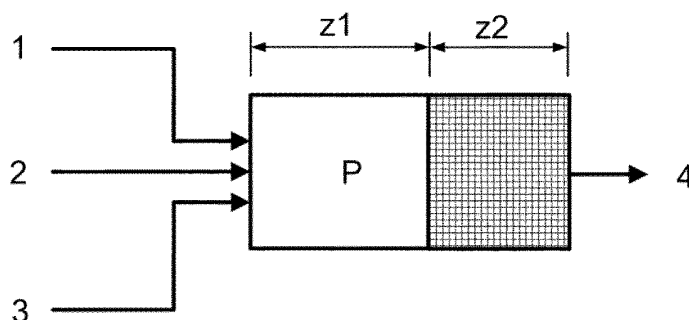


Figure 1

(57) Abstract: The present invention relates to a process for converting carbon dioxide and hydrogen by performing a reverse water gas shift reaction at elevated temperature, the process comprising introducing carbon dioxide, hydrogen and oxygen into a reaction vessel having an inlet and an outlet, and, wherein the reverse water gas shift reaction takes place in two different zones of the reaction vessel, being a top zone (z1) adjacent to a bottom zone (z2), wherein (a) no catalyst is present in the top zone (z1) of the reaction vessel, and (b) at least a gas stream comprising carbon dioxide, a hydrogen rich gas stream and an oxygen rich gas stream are introduced into the inlet at the top zone (z1) of the reaction vessel in separate feed streams, wherein the hydrogen rich gas stream is introduced into the reaction vessel at a temperature between 15 and 450°C, (c) the hydrogen rich gas stream and oxygen rich gas stream being introduced in close vicinity of each other, wherein at least the hydrogen rich gas stream and the oxygen rich gas stream are introduced into the reaction vessel via a burner comprising coaxial channels for the separate introduction of the different gas streams, the burner being located at the top of the reaction vessel, wherein the hydrogen and oxygen in the hydrogen rich gas stream and oxygen rich gas stream undergo a combustion reaction upon entering the reaction vessel, thereby providing the heating energy required for the reverse water-gas shift reaction; and (d) the temperature in the top zone (z1) of the reaction vessel is maintained in the range of 700 to 1200°C by varying the flow of any of the gas streams which are introduced into the reaction vessel; and (e) the bottom zone (z2) of the reaction vessel is provided with a

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catalyst bed comprising a reverse water gas shift catalyst, the top of the catalyst bed being placed at a distance from the burner in the top zone (z1) sufficient to prevent damage from flame impingement on the catalyst bed; (f) wherein in the bottom zone (z2) of the reaction vessel a catalytic reverse water gas shift reaction takes place at elevated temperatures, thereby converting unconverted carbon dioxide and hydrogen; to produce a product stream comprising mainly carbon monoxide, hydrogen and water. The process is useful in reducing the carbon footprint of certain industrial technologies, and in addition, the process is useful in the production of synthesis gas.