C L A I M S

1. A process for converting carbon dioxide and hydrogen into a product stream comprising carbon monoxide, water and hydrogen, the process comprising introducing carbon dioxide, hydrogen and oxygen into a reaction vessel, and performing a reverse water gas shift reaction at elevated temperature, wherein

(a) no catalyst is present in 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 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 ^{o}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 reaction vessel is maintained in the range of 1000 to 1500 ^{o}C by varying the molar ratio of hydrogen to oxygen, which are introduced into the reaction vessel in the hydrogen rich gas stream and oxygen rich gas stream, respectively; wherein part of the gas stream containing carbon dioxide is introduced via a channel in between the hydrogen rich gas stream and the oxygen rich gas stream, the oxygen rich gas stream being introduced via the

inner channel of the burner, and the remaining part of the gas stream containing carbon dioxide is introduced in an outer channel of the burner, being outside of the channels for the hydrogen rich gas stream and oxygen rich gas stream.

2. A process according to claim 1, wherein in step (c) the hydrogen rich gas stream and oxygen rich gas stream are introduced into the reaction vessel in close vicinity of but not next to each other.

~~3. A process according to claim 1 or 2, wherein part of the gas stream containing carbon dioxide is introduced via a channel in between the hydrogen rich gas stream and the oxygen rich gas stream, the oxygen rich gas stream being introduced via the inner channel of the burner, and the remaining part of the gas stream containing carbon dioxide is introduced in an outer channel of the burner, being outside of the channels for the hydrogen rich gas stream and oxygen rich gas stream.~~

~~4~~3. A process according to ~~any one of~~ claim~~s~~ 1 ~~to 3~~or 2, wherein the reaction vessel is preheated to a temperature ranging up to 1100 °C.

~~5~~4. A process according to any one of claims 1 to ~~4~~3, wherein the product stream leaving the hot reaction vessel is cooled with water to provide a cooled product mixture comprising carbon monoxide, ~~and~~ hydrogen~~,~~ and steam.

5. The process of claim 4 wherein the cooled product mixture further comprises ~~and optionally~~ unconverted carbon dioxide.

6. A process according to claim 4 or 5, wherein the product stream or steam produced after cooling the product stream is used to preheat one or more of the feed gas streams selected from the gas stream comprising carbon dioxide, the hydrogen rich gas stream, and the oxygen rich gas stream.

7. The process of claim 6, wherein the product stream or steam produced after cooling the product stream is used to preheat one or more ~~and optionally~~ additional gas streams introduced into the reaction vessel as co-feed or pre-mixed gas streams.

~~7~~8. A process according to any one of claims 1 to ~~6~~7, wherein at least part of the hydrogen rich gas stream and/or at least part of the oxygen rich gas stream in the feed is obtained from a water splitter.

~~8~~9. A process according to claim ~~7~~8, wherein the oxygen rich gas stream from the water splitter is liquified and re-gasified before use as feed.

~~9~~10. A process according to claim 4 or 5, wherein steam is separated from the product mixture and then further cooled to the dew point to provide liquid water which is recycled to a water splitter to produce hydrogen and/or oxygen.

~~10. A reverse water-gas shift process unit comprising at least one reaction vessel operatively connected to a cooling unit, and further comprising a gas introduction line connected.~~