

9

3. The system of claim 1 wherein fuel is delivered to said mixing tube through a cooled delivery line.

4. The systems of claim 3 wherein said cooled delivery line is cooled by a water line proximate to said delivery line.

5. The system of claim 1 wherein said fuel is introduced into said flow of steam by atomizing said preselected quantity of fuel through a hollow needle.

6. The system of claim 1 wherein said fuel is mixed into said steam in a molar concentration ratio of about three or more moles of steam per mole of carbon contained in the fuel.

7. A method for reducing carbon deposition in reformat fuel cell applications, said method comprising the steps of:

providing a stream of steam having a preselected quantity of superheat within said stream of steam;

adding a preselected quantity of fuel into said stream of steam;

mixing said fuel and stream of steam so as to obtain uniform mixing of said fuel within said stream of steam;

delivering a mixture of fuel and steam to a prereformer, said prereformer containing at least one catalyst therein; and

passing said mixture from said prereformer to a reformer device having an inlet header, said header having a catalyst included therein.

8. The method of claim 7 wherein said fuel is added into said stream of steam through a hollow needle inserted within said stream of steam.

9. The method of claim 8 wherein said fuel is maintained below a predesignated temperature until just prior to being added to said stream of steam.

10. The method of claim 7 wherein said stream of steam is superheated by a superheating device prior to the injection of said fuel into said stream of steam

11. The method of claim 7 further comprising the step of passing said stream of steam and said fuel through a prereformer containing at least one catalyst, prior to passing said stream of steam and fuel into a reformer.

12. A method for reducing carbon deposits in steam reformat systems, said method comprising the step of passing said steam hydrocarbon mixtures through a prereformer that includes catalysts for partially treating said steam hydrocarbon mixtures prior to passing said steam hydrocarbon mixtures through a reformer having a header said header containing a catalyst containing insert therein.

13. A system for reducing carbon deposition in a steam reformer useful for providing hydrogen to a fuel cell, said system comprising;

steam source, configured to produce a steady source of steam;

10

a superheater operatively connected to said steam source, whereby steam from said steam source is transferred to said superheater, said steam super heater configured to superheat steam from said steam source;

a mixing tube extending between said superheater and a prereformer, said mixing tube having an inlet for receiving delivery of a preselected quantity of a preselected fuel into a stream of steam passing through said mixing tube; said mixing tube being of sufficient proportions so as to allow thorough mixing of said preselected quantity of said preselected fuel within said stream of steam, so as to form a mixture;

a prereformer operatively connected to said mixing tube, so as to receive said mixture within said prereformer and to treat said mixture with at least catalyst;

a reformer operatively connected to said prereformer so as to receive a partially treated mixture from said prereformer and to reform said mixture, said reformer having at least one catalyst located within a header of said reformer.

14. In a system comprising a steam source, configured to produce a steady source of steam; a superheater operatively connected to said steam source, whereby steam from said steam source is transferred to said superheater; a mixing tube extending between said superheater and a prereformer, a prereformer operatively connected to said mixing tube, so as to receive a mixture of steam and a fuel within said prereformer and to treat said mixture with at least one catalyst; a reformer operatively connected to said prereformer so as to receive partially treated mixture from said prereformer and to reform said mixture, said reformer having at least one catalyst located within a header portion of an inlet of said reformer; a method for reducing carbon deposition and methane formation in reformat systems, said method comprising the steps of

providing a stream of steam having a preselected quantity of superheat within said stream of steam by superheating said stream of steam;

adding a preselected quantity of fuel into said stream of steam, through a hollow needle positioned within said stream of steam, said fuel maintained below a predesignated temperature until just prior to being added to said stream of steam;

mixing said fuel and stream of steam so as to obtain an even mixing of said fuel within said stream of steam; and

passing said stream of steam and said fuel through said prereformer containing at least one catalyst, prior to passing said stream of steam and fuel into said reformer.

\* \* \* \* \*