a steam reforming catalyst; or if the first reaction chamber comprises a steam reforming catalyst, the second reaction chamber comprises a combustion catalyst, and wherein the first inlet and the first outlet are connected to the first reaction chamber such that, during operation, fluid flows in more than one direction through the first reaction chamber between the first inlet and the first outlet; wherein the combustion catalyst and the steam reforming catalyst are present as coatings on opposite faces of a separation plate; and wherein the first reaction chamber and the second reaction chamber are disposed on opposite sides of a transverse separation plate that is transverse to a main longitudinal axis of the steam reformer.

2. The steam reformer of claim **1** comprising an inlet of the first reaction chamber disposed in a central portion relative to the main longitudinal axis and an outlet of the first reaction chamber disposed in a peripheral portion relative to the main longitudinal axis.

3. The steam reformer of claim **2** comprising an inlet of the second reaction chamber disposed in a central portion relative to the main longitudinal axis and an outlet of the second reaction chamber disposed in a peripheral portion relative to the main longitudinal axis.

4. The steam reformer of claim **1** wherein the first reaction chamber and the second reaction chamber each have a diameter of 15 mm or less.

5. The steam reformer of claim **1** having an overall volume of 20 ml or less.

6. A fuel cell comprising the steam reformer of claim **1**.

7. A steam reformer comprising: a first reaction chamber connected to a first inlet and a first outlet; a second reaction chamber connected to a second inlet and a second outlet; the first reaction chamber and the second reaction chamber being in thermal communication, wherein the first reaction chamber comprises a combustion catalyst or a steam reforming catalyst, wherein, if the first reaction chamber comprises a combustion catalyst, the second reaction chamber comprises a steam reforming catalyst; or if the first reaction chamber comprises a steam reforming catalyst, the second reaction chamber comprises a combustion catalyst, and wherein the first inlet and the first outlet are connected to the first reaction chamber such that, during operation, fluid flows in more than one direction through the first reaction chamber between the first inlet and the first outlet; and wherein the first reaction chamber and the second reaction chamber are disposed on opposite sides of a transverse separation plate that is transverse to a main longitudinal axis of the steam reformer.

8. The steam reformer of claim **7** wherein the combustion catalyst and the steam reforming catalyst are present as coatings on opposite faces of a separation plate.

9. The steam reformer of claim **7** wherein the combustion catalyst has a disk shape, wherein the steam reforming catalyst has a disk shape; and wherein, during operation, fluid entering the combustion catalyst enters the center of the disk and flows radially out from the center of the disk, and fluid entering the steam reforming catalyst enters the center of the disk and flows radially out from the center of the disk.

10. The steam reformer of claim **7** wherein the first reaction chamber comprises a combustion catalyst and further comprising a exhaust chamber in fluid communication with the first reaction chamber and a transverse catalyst plate disposed between the first reaction chamber and the exhaust chamber.

11. The steam reformer of claim **7** having an overall volume of 1 ml or less.

12. The steam reformer of claim **7** wherein the reaction chamber comprising the steam reforming catalyst has at least 3 times the volume of the reaction chamber comprising the combustion catalyst.

13. A steam reformer comprising: a first reaction chamber connected to a first inlet and a first outlet; a second reaction chamber connected to a second inlet and a second outlet; the first reaction chamber and the second reaction chamber being in thermal communication, wherein the first reaction chamber comprises a combustion catalyst or a steam reforming catalyst, wherein, if the first reaction chamber comprises a combustion catalyst, the second reaction chamber comprises a steam reforming catalyst; or if the first reaction chamber comprises a steam reforming catalyst, the second reaction chamber comprises a combustion catalyst, and wherein the first inlet and the first outlet are connected to the first reaction chamber such that, during operation, fluid flows in more than one direction through the first reaction chamber between the first inlet and the first outlet; wherein the combustion catalyst has a disk shape, wherein the steam reforming catalyst has a disk shape; and wherein, during operation, fluid entering the combustion catalyst enters the center of the disk and flows radially out from the center of the disk, and fluid entering the steam reforming catalyst enters the center of the disk and flows radially out from the center of the disk.

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