Claims:

1. A method of producing hydrogen gas using a hydrogen generator, the hydrogen generator comprising a container; a first reactant storage area within the container, the first reactant storage area having a volume and containing a fluid comprising a first reactant; a reaction area within the container, the reaction area having a volume; an effluent storage area within the container, the effluent storage area having a volume; a fluid passage from the first reactant storage area to the reaction area; an effluent passage from the reaction area to the effluent storage area; a compressed filter contained within the effluent storage area; a liquid impermeable, gas permeable component; and a hydrogen outlet; the method comprising the steps:

moving the first reactant from the first reactant storage area, through the fluid passage, to the reaction area;

reacting the first reactant in the reaction area to produce hydrogen gas and an effluent;

moving the hydrogen gas and the effluent from the reaction area, through the effluent passage, to the effluent storage area; and

passing the hydrogen gas through the filter and the liquid impermeable, gas permeable component to the outlet;

wherein:

the first reactant storage area volume, the reaction area volume or both the first reactant storage area and the reaction area volumes decrease, the filter expands, and the effluent storage area volume increases as the first reactant is moved from the first reactant storage area and the hydrogen gas and the effluent are moved from the reaction area to the effluent storage area;

a moveable partition separates the effluent storage area from at least one of the first reactant storage area and the reaction area;

a portion of the filter is attached to the moveable partition; and

all hydrogen gas passing to the outlet passes through the effluent storage area.

2. A hydrogen generator comprising:

a container;

a first reactant storage area within the container, the first reactant storage area having a volume and configured to contain a fluid comprising a first reactant;

a reaction area within the container, the reaction area having a volume;

a fluid passage from the first reactant storage area to the reaction area;

an effluent storage area within the container, the effluent storage area having a volume and configured to store hydrogen gas and an effluent produced by a reaction of the first reactant within the reaction area;

an effluent passage from the reaction area to the effluent storage area;

an initially compressed filter within the effluent storage area;

a liquid impermeable, gas permeable component in fluid communication with the effluent storage area; and

a hydrogen outlet;

wherein:

the initially compressed filter is configured to expand to contain a portion of the effluent, the effluent storage area volume is configured to increased, and at least one of the first reactant storage area volume and the reaction area volume is configured to decrease during operation of the hydrogen generator;

a moveable partition separates the effluent storage area from at least one of the first reactant storage area and the reaction area;

a portion of the filter is attached to the moveable partition; and

the first reactant can react to produce hydrogen gas, and all of the hydrogen gas must pass through a portion of the effluent storage area to reach the hydrogen outlet.

3. The hydrogen generator according to claim 2, wherein the filter is configured to apply a force for reducing the first reactant storage area volume, the reaction area volume or both the first reactant storage area volume and the reaction area volume during operation of the hydrogen generator.

4. The hydrogen generator according to claim 3, wherein the hydrogen generator further comprises a biased component configured to apply a force for reducing the first reactant storage area volume, the reaction area volume or both the first reactant storage area volume and the reaction area volume during operation of the hydrogen generator.

5. The hydrogen generator according to any of claims 2 to 4, wherein the filter comprises at least two areas of different porosity prior to compression.

6. The hydrogen generator according to claim 5, wherein the filter comprises two distinct components, each having a different porosity prior to compression.

7. The hydrogen generator according to claim 5 or claim 6, wherein the area of greatest porosity prior to compression is closest to the effluent passage and the area of least porosity is closest to the outlet.

8. The hydrogen generator according to any of claims 2 to 7, wherein the filter comprises an open cell foam.

9. The hydrogen generator according to any of claims 2 to 8, wherein the moveable partition comprises a flexible effluent enclosure within the effluent storage area, the flexible effluent enclosure has a volume, and the filter is contained within and attached to a portion of the flexible effluent enclosure.

10. The hydrogen generator according to claim 9, wherein the moveable partition further comprises a rigid wall adjacent to the flexible effluent enclosure.

11. The hydrogen generator according to claim 9 or claim 10, wherein the volume of the flexible effluent enclosure is configured to increase during operation of the hydrogen generator.

12. The hydrogen generator according to any of claims 2 to 11, wherein the moveable partition pulls the filter to expand the filter.

13. The method according to any of claims 2 to 12, wherein the filter comprises an elastic material, and the filter expands as a result of a reduction in a compressive stress in the filter.

14. The hydrogen generator according to any of claims 2 to 13, wherein the first reactant is initially contained within a flexible first reactant enclosure within the first reactant storage area.

15. The hydrogen generator according to any of claims 2 to 14, wherein the hydrogen generator further comprises a second reactant initially contained within a flexible second reactant enclosure within the reaction area, wherein the flexible second reactant enclosure is wrapped with a biasing component configured to apply a force to reduce the volume of the second reactant enclosure as the first reactant and the second reactant react.

The invention claimed is:

1. A method of producing hydrogen gas using a hydrogen generator, the hydrogen generator comprising a container; a first reactant storage area within the container, the first reactant storage area having a volume and containing a fluid comprising a first reactant; a reaction area within the container, the reaction area having a volume; an effluent storage area within the container, the effluent storage area having a volume; a fluid passage from the first reactant storage area to the reaction area; an effluent passage from the reaction area to the effluent storage area; a compressed filter contained within the effluent storage area; a liquid impermeable, gas permeable component; and a hydrogen outlet; the method comprising the steps:

moving the first reactant from the first reactant storage area, through the fluid passage, to the reaction area;

reacting the first reactant in the reaction area to produce hydrogen gas and an effluent;

moving the hydrogen gas and the effluent from the reaction area, through the effluent passage, to the effluent storage area; and

passing the hydrogen gas through the filter and the liquid impermeable, gas permeable component to the outlet;

wherein:

the first reactant storage area volume, the reaction area volume or both the first reactant storage area and the reaction area volumes decrease, the filter expands, and the effluent storage area volume increases as the first reactant is moved from the first reactant storage area and the hydrogen gas and the effluent are moved from the reaction area to the effluent storage area;

a moveable partition separates the effluent storage area from at least one of the first reactant storage area and the reaction area;

a portion of the filter is attached to the moveable partition; and

all hydrogen gas passing to the outlet passes through the effluent storage area.

2. A hydrogen generator comprising:

a container;

a first reactant storage area within the container, the first reactant storage area having a volume and configured to contain a fluid comprising a first reactant;

a reaction area within the container, the reaction area having a volume;

a fluid passage from the first reactant storage area to the reaction area;

an effluent storage area within the container, the effluent storage area having a volume and configured to store hydrogen gas and an effluent produced by a reaction of the first reactant within the reaction area;

an effluent passage from the reaction area to the effluent storage area;

an initially compressed filter within the effluent storage area;

a liquid impermeable, gas permeable component in fluid communication with the effluent storage area; and

a hydrogen outlet;

wherein:

the initially compressed filter is configured to expand to contain a portion of the effluent, the effluent storage area volume is configured to increased, and at least one of the first reactant storage area volume and the reaction area volume is configured to decrease during operation of the hydrogen generator;

a moveable partition separates the effluent storage area from at least one of the first reactant storage area and the reaction area;

a portion of the filter is attached to the moveable partition; and

the first reactant can react to produce hydrogen gas, and all of the hydrogen gas must pass through a portion of the effluent storage area to reach the hydrogen outlet.

3. The hydrogen generator according to claim 2, wherein the filter is configured to apply a force for reducing the first reactant storage area volume, the reaction area volume or both the first reactant storage area volume and the reaction area volume during operation of the hydrogen generator.

4. The hydrogen generator according to claim 3, wherein the hydrogen generator further comprises a biased component configured to apply a force for reducing the first reactant storage area volume, the reaction area volume or both the first reactant storage area volume and the reaction area volume during operation of the hydrogen generator.

5. The hydrogen generator according to any of claims 2 to 4, wherein the filter comprises at least two areas of different porosity prior to compression.

6. The hydrogen generator according to claim 5, wherein the filter comprises two distinct components, each having a different porosity prior to compression.

7. The hydrogen generator according to claim 5 or claim 6, wherein the area of greatest porosity prior to compression is closest to the effluent passage and the area of least porosity is closest to the outlet.

8. The hydrogen generator according to any previous claim, wherein the filter comprises a material that does not have an affinity for a liquid in the effluent.

9. The hydrogen generator according to claim 8, wherein a portion of the filter proximate the effluent entryway to the effluent storage area does not have an affinity for the liquid in the effluent.

10. The hydrogen generator according to any previous claim, wherein the filter comprises a material that has an affinity for a liquid in the effluent.

11. The hydrogen generator according to claim 10, wherein a portion of the filter proximate the liquid impermeable, gas permeable component has an affinity for the liquid in the effluent.

12. The hydrogen generator according to any of claims 2 to 11, wherein the filter comprises an open cell foam.

13. The hydrogen generator according to any of claims 2 to 12, wherein the moveable partition comprises a flexible effluent enclosure within the effluent storage area, the flexible effluent enclosure has a volume, and the filter is contained within and attached to a portion of the flexible effluent enclosure.

14. The hydrogen generator according to claim 13, wherein the moveable partition further comprises a rigid wall adjacent to the flexible effluent enclosure.

15. The hydrogen generator according to claim 13 or claim 14, wherein the volume of the flexible effluent enclosure is configured to increase during operation of the hydrogen generator.

16. The hydrogen generator according to any of claims 2 to 15, wherein the moveable partition pulls the filter to expand the filter.

17. The method according to any of claims 2 to 16, wherein the filter comprises an elastic material, and the filter expands as a result of a reduction in a compressive stress in the filter.

18. The hydrogen generator according to any of claims 2 to 17, wherein the first reactant is initially contained within a flexible first reactant enclosure within the first reactant storage area.

19. The hydrogen generator according to any of claims 2 to 18, wherein the hydrogen generator further comprises a second reactant.

20. The hydrogen generator according to claim 19, wherein the second reactant is initially contained within a flexible second reactant enclosure within the reaction area.

21. The hydrogen generator according to claim 20, wherein the flexible second reactant enclosure is wrapped with a biasing component configured to apply a force to reduce the volume of the second reactant enclosure as the first reactant and the second reactant react.

22. The hydrogen generator according to any of claims 2 to 21, wherein at least one of the first reactant and the second reactant comprises a borohydride.

23. The hydrogen generator according to claim 22, wherein at least one of the first reactant and the second reactant is part of a composition that comprises at least one of an acid and a metal compound catalyst.

24. The hydrogen generator according to any of claims 2 to 23, wherein the reaction area further comprises a catalyst.