CLAIMS

1. An air-permeable substrate structure for use in a non-hydrated purified hydrogen peroxide gas (PHPG)-generating device comprising
    a. a mesh having a percentage of open area between 10% and 60%; and
    b. a catalyst disposed on its surface.

2. The structure of claim 1, wherein said mesh has a percentage of open area between 20% and 40%.

3. The structure of claim 1, wherein said mesh has a percentage of open area between 36% and 38%.

4. The structure of claim 1, wherein said mesh has a percentage of open area of about 37%.

5. The structure of claim 1, wherein said mesh has a percentage of open area between 20 and 60%.

6. The structure of claim 1, wherein said air-permeable substrate structure has a pH of greater than 7.0 on said catalyst surface.

7. The structure of claim 1, wherein said air-permeable substrate structure has a pH of between 7.0 and 9.0 on said catalyst surface.

8. The structure of claim 1, wherein said air-permeable substrate structure has a catalyst on its surface that is between 20 nm and 40 nm thick.

9. The structure of claim 1, wherein said air-permeable substrate structure has a catalyst on its surface that is between 100nm and 200nm thick.

10. The structure of claim 1, wherein said air-permeable substrate structure has a catalyst on its surface that is selected from the group consisting of between 250 nm to 500 nm thick and between 500 nm to 750 nm thick.

11. The structure of claim 1, wherein said catalyst is a metal, a metal oxide, or mixtures thereof.

12. The structure of claim 11, wherein said metal or metal oxide catalyst is selected from the group consisting of titanium dioxide, copper, copper oxide, zinc, zinc oxide, iron, iron oxide, tungsten, tungsten trioxide, and mixtures thereof.

13. The structure of claim 11, wherein said metal or metal oxide catalyst further comprises a co-catalyst selected from platinum, silver, gold, nickel, palladium, cesium, copper, rhodium, ruthenium, osmium, iridium, zirconium dioxide, titanium dioxide ceramic, or extruded ceramic.

14. The structure of claim 1, wherein said catalyst comprises one or more additives.

15. The structure of claim 14, wherein said one or more additives is a hygroscopic additive.

16. The structure of claim 15, wherein said hygroscope additive is selected from the group consisting of: sodium bicarbonate, potassium bicarbonate, sodium carbonate, potassium carbonate, magnesium carbonate, magnesium bicarbonate, sodium hydroxide, potassium hydroxide, magnesium hydroxide, zinc chloride, calcium chloride, magnesium chloride, sodium phosphate, potassium phosphate, magnesium phosphate, carnallite, ferric ammonium citrate, nylon, acrylonitrile butadiene styrene (ABS), polycarbonate, cellulose, poly(methyl methacrylate), and combinations thereof.

17. The structure of claim 13, wherein said co-catalyst is at levels of up to about 5% of the total mass of the catalyst.

18. The structure of claim 13, wherein said co-catalyst is at levels less than 0.05% of the total mass of the catalyst.

19. The structure of claim 1, wherein said air-permeable substrate structure comprises an incident angle of 90°, at least 14°, or between 68° and 90°, relative to an airflow.

20. The structure of claim 1, wherein said air-permeable substrate structure comprises a mesh having a thread thickness of between 48 microns and 175 microns.

21. The structure of claim 1, wherein said air-permeable substrate structure comprises a mesh having a hole size of between 25 microns and 220 microns.

22. The structure of claim 1, wherein said air-permeable substrate structure comprises a mesh having a hole size of between 25 microns and 220 microns.

23. The structure of claim 1, wherein said catalyst on a surface of said substrate structure is between 20 nm and 40 nm thick.

24. The structure of claim 1, wherein said catalyst on a surface of said substrate structure is between 100 nm and 200 nm thick.

25. The structure of claim 1, wherein said catalyst on a surface of said substrate structure is selected from the group consisting of between 250 nm to 500 nm and between 500 nm to 750 nm thick.

26. The structure of claim 13, wherein mixtures of said co-catalysts have a combined amount of up to 10% of the total mass of the catalyst.