CLAIMS

WHAT IS CLAIMED IS:

1. An apparatus for treating an eye, the apparatus comprising:

a housing comprising a fluid-filled chamber and an eye-contacting surface configured to contact a surface of an eye;

a first electrode disposed within the housing; and

a second electrode disposed within the housing and coaxially aligned with the first electrode, wherein a distal tip of the first electrode and a distal tip of the second electrode are separated by a gap,

wherein the first electrode and the second electrode are configured to generate an electric arc across the gap when energized and produce a shockwave in a fluid of the fluid-filled chamber; and

wherein the apparatus further comprises a fluid inlet and a fluid outlet in fluid communication with the fluid filled chamber.

2. The apparatus of claim 1, wherein an inner surface of the housing is configured to focus the shockwave to a predetermined location on or below the surface of the eye.

3. The apparatus of claim 1 or 2, further comprising a reflector disposed within the housing and configured to focus the shockwave to a predetermined location on or below the surface of the eye.

4. The apparatus of any of claims 1-3, further comprising one or more wires coupled to the first electrode or second electrode and configured to provide energy thereto.

5. The apparatus of any of claims 1-4, wherein the first electrode and the second electrode comprise a first tip of a first wire and a second tip of a second wire.

6. The apparatus of any of claims 1-5, wherein the fluid comprises saline or water.

7. The apparatus of any of claims 1-6, wherein the first and second electrodes are coated with graphene to reduce erosion during use shockwave production.

8. The apparatus of any of claims 1-7, wherein the housing is ellipsoidal.

9. The apparatus of any of claims 1-8, wherein the housing further comprises a fluid-filled wave guide disposed between the fluid-filled chamber and the eye-contacting surface and configured to fluidly couple the fluid-filled chamber and the eye-contacting surface.

10. The apparatus of any of claims 1-9, further comprising an acoustic lens disposed within the housing and configured to focus the shockwave to one or more predetermined locations on or below the surface of the eye.

11. The apparatus of any of claims 1-10, further comprising a conductivity sensor at least partially disposed within the fluid-filled chamber and configured to measure a conductivity of the fluid within the fluid-filled chamber.

12. The apparatus of claim 11, wherein the conductivity sensor comprises a pair of platinum electrodes.

13. The apparatus of any of claims 1-12, further comprising a light source at least partially disposed within the fluid-filled chamber and configured to emit light towards the surface of the eye.

14. A system for treating an eye, the system comprising:

the apparatus of any of claims 1-13; and

an energy source operably coupled to the first electrode and the second electrode by one or more wires.

15. The system of claim 14, wherein the first electrode is coupled to a positive terminal of the energy source and the second electrode is coupled to a negative terminal of the energy source.

16. The system of claim 14 or 15, wherein the energy source comprises a high voltage pulse generator.

17. The system of any of claims 14-16, further comprising a current sensor coupled to the first electrode or the second electrode configured to determine a current level flowing to the first electrode or the second electrode.

18. The system of any of claims 14-17, further comprising a conductivity sensor fluidly coupled to the fluid outlet and configured to measure a conductivity of the fluid as it flows out of the fluid outlet.

19. The system of any of claims 14-18, further comprising a fluid recirculation system fluidly coupled to the fluid outlet and the fluid inlet and configured to recirculate fluid from the fluid-filled chamber and remove cavitation bubbles from the fluid.

20. The system of any of claims 14-19, further comprising a reservoir disposed on or under the eye-contacting surface.

21. The system of claim 20, wherein the reservoir comprises oxygen.

22. The system of claim 20, wherein the reservoir comprises riboflavin.

23. The system of claim 20, wherein the reservoir comprises a therapeutic agent.

24. An apparatus for treating an eye, the apparatus comprising:

a housing comprising a fluid-filled chamber and an eye-contacting surface configured to contact a surface of an eye; and

an optical fiber disposed within the housing,

wherein the optical fiber is configured to generate shockwave in a fluid of the fluid-filled chamber when optical energy is emitted therefrom; and

wherein the apparatus further comprises a fluid inlet and a fluid outlet in fluid communication with the fluid-filled chamber.

25. The apparatus of claim 24, wherein an inner surface of the housing is configured to focus the shockwave to a predetermined location on or below the surface of the eye.

26. The apparatus of claim 24 or 25, further comprising a reflector disposed within the housing and configured to focus the shockwave to a predetermined location on or below the surface of the eye.

27. The apparatus of any of claims 24-26, wherein the fluid comprises saline or water.

28. The apparatus of any of claims 24-27, wherein the fluid comprises graphene to reduce light emission from the housing when the shockwave is generated.

29. The apparatus of any of claims 24-28, wherein the housing is ellipsoidal.

30. The apparatus of any of claims 24-29, wherein the housing further comprises a fluid-filled wave guide disposed between the fluid-filled chamber and the eye-contacting surface and configured to fluidly couple the fluid-filled chamber and the eye-contacting surface.

31. The apparatus of any of claims 24-30, further comprising an acoustic lens disposed within the housing and configured to focus the shockwave to one or more predetermined locations on or below the surface of the eye.