

CLAIMS

1. A sterilisation device for generating a flow of hydroxyl radicals, the sterilisation device comprising:

5 a housing defining a water mist fluid flow path between an inlet for receiving water mist and an outlet for directing a flow of hydroxyl radicals towards a region to be sterilised;

an energy delivery tip configured to produce a thermal or non-thermal plasma;

10 a coaxial transmission line mounted in the housing and arranged to convey radiofrequency (RF) and/or microwave frequency electromagnetic (EM) energy to the energy delivery tip; and

15 a gas conduit mounted in the housing and arranged to deliver gas to the energy delivery tip,

wherein the coaxial transmission line comprises an inner conductor, an outer conductor, and a dielectric material separating the inner conductor from the outer conductor,

20 wherein the energy delivery tip extends from a distal end of the coaxial transmission line, and

wherein the energy delivery tip comprises:

a first electrode electrically connected to the inner conductor of the coaxial transmission line; and

25 a second electrode electrically connected to the outer conductor of the coaxial transmission line, wherein the second electrode is configured to define an internal volume of the energy delivery tip, wherein the first electrode extends longitudinally within the internal volume,

30 wherein the first electrode and second electrode are configured to:

strike a plasma in the gas delivered to the energy delivery tip, and

35 direct the plasma into the water mist fluid flow path to form hydroxyl radicals therein.

2. A sterilisation device according to claim 1, wherein the energy delivery tip is located within the housing.

40 3. A sterilisation device according to claim 2, wherein the first electrode and second electrode define an exit from

the internal volume, wherein the exit is located at or in the outlet.

4. A sterilisation device according to any preceding claim, wherein the first electrode is formed from a length of the inner conductor that extends beyond a distal end of the outer conductor.

5. A sterilisation device according to any preceding claim, wherein the first electrode comprises a conductive end cap mounted beyond a distal end of the second electrode, the conductive end cap being configured to deflect the plasma transversely into the water mist fluid flow path.

6. A sterilisation device according to any preceding claim, wherein the water mist fluid flow path tapers towards the outlet.

7. A sterilisation device according to any preceding claim, wherein the energy delivery tip further comprises an insulating cap mounted at a distal end of the coaxial transmission line to isolate the coaxial transmission line from the internal volume, and wherein the gas conduit includes a fluid pathway formed between the insulating cap and the second electrode.

8. A sterilisation device according to claim 7, wherein the insulating cap is mounted within the second electrode, and wherein the fluid pathway comprises a plurality of openings in the second electrode that permit gas flow around the insulating cap.

9. A sterilisation device according to claim 8, wherein the second electrode is a cylinder, and the plurality of openings each comprise a notch in the cylinder.

10. A sterilisation device according to claim 9, wherein a proximal end of the second electrode is castellated to provide the plurality of openings.

11. A sterilisation device according to any preceding claim, wherein the energy delivery tip comprises an insulating dielectric material located between the first electrode and the second electrode in the internal volume.

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12. A sterilisation device according to claim 11, wherein the dielectric material is quartz.

13. A sterilisation device according to any preceding claim, wherein the housing is configured as a handheld unit.

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14. A sterilisation apparatus comprising:
a sterilisation device according to any one of claims 1 to 13;
a mist generator;
a gas supply; and
a generator for supplying radiofrequency (RF) and/or microwave frequency electromagnetic energy to the sterilisation device.

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15. A sterilisation apparatus according to claim 14, wherein the mist generator comprises either:
an ultrasonic transducer, or
a heating element.

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16. A sterilisation apparatus according to claim 14 or claim 15, wherein the gas supply is a supply of argon gas.

17. A sterilisation apparatus according to any one of claims 14 to 16, wherein the generator is powered by a battery.

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