

CLAIMS

What is claimed is:

1. A system for generating and monitoring an antimicrobial, comprising:
a computational system;
an antimicrobial sensor; and
an antimicrobial generator,
wherein the computational system, the antimicrobial generator, and the antimicrobial sensor are operatively connected.
2. The system of claim 1, wherein the computational system is at least one of a microprocessor and a microcontroller.
3. The system of claim 1, further comprising an external communication device.
4. The system of claim 1, further comprising a separate sensor sub-system comprising:
at least one of a sensor sub-system microprocessor and a sensor sub-system microcontroller;
a sensor sub-system external communications device;
at least one of a sensor sub-system antimicrobial sensor and a sensor sub-system environmental sensor; and
a sensor sub-system computational system.
5. The system of claim 1, further comprising a separate generation sub-system comprising:
at least one of a generation sub-system microprocessor and a generation sub-system microcontroller;
a generation sub-system external communications device; and
a generation sub-system antimicrobial generator.
6. The system of claim 3, wherein the external communications device, the computational system, the antimicrobial generator, and the at least one of an antimicrobial sensor and an environmental sensor is oriented within an enclosed volume under treatment.
7. The system of claim 4, wherein at least one sensor sub-system is oriented within an enclosed volume under treatment.
8. The system of claim 5, wherein at least one generation sub-system is oriented within an enclosed volume under treatment.
9. A system for generating and monitoring an antimicrobial, comprising:
a sensor sub-system comprising:

at least one of a sensor sub-system microprocessor and a sensor sub-system microcontroller,
a sensor sub-system external communications device,
at least one of a sensor sub-system antimicrobial sensor and a sensor sub-system environmental sensor, and
a sensor sub-system computational system;
a generation sub-system comprising:
at least one of a generation sub-system microprocessor and a generation sub-system microcontroller,
a generation sub-system external communications device, and
a generation sub-system antimicrobial generator; and
an enclosed space forming a volume under treatment.

10. The system of claim 9, wherein the sensor sub-system and the generation sub-system are oriented within the enclosed volume under treatment.

11. The system of claim 9, wherein the sensor sub-system is oriented within the enclosed volume under treatment and wherein the generation sub-system is oriented outside of the enclosed volume under treatment.

12. The system of claim 9, wherein the generation sub-system is oriented within the enclosed volume under treatment and wherein the sensor sub-system is oriented outside of the enclosed volume under treatment.

13. The system of claim 9, further comprising an HVAC air supply fluidically connected to the interior of the enclosed volume under treatment, wherein the sensor sub-system is oriented within the enclosed volume under treatment, wherein the generation sub-system is oriented outside of the enclosed volume under treatment, and wherein the generation sub-system is fluidically connected to the HVAC air supply.

14. The system of claim 9, further comprising an HVAC air return fluidically connected to the interior of the enclosed volume under treatment, wherein the generation sub-system is oriented within the enclosed volume under treatment, wherein the sensor sub-system is oriented outside of the enclosed volume under treatment, and wherein the sensor sub-system is fluidically connected to the HVAC air return.

15. A system for generating and monitoring ClO₂, comprising:
a device housing including an inlet;
a microcontroller or microprocessor;
a reagent container containing a reagent;

a device for generating a ClO₂ from the reagent; and
a sensing system.

16. The system of claim 15, wherein the system comprises two reagent containers, and wherein each reagent container contains a different reagent.

17. The system of claim 16, wherein the device for generating the ClO₂ is a microfluidic mixer, and wherein the two reagents mix in the microfluidic mixer to generate the ClO₂.

18. The system of claim 15, wherein the device for generating the ClO₂ is an electrochemical generator.

19. The system of claim 15, wherein the sensing system measures a concentration of ClO₂ in ambient air introduced via the inlet.

20. The system of claim 19, wherein the measurement of concentration of ClO₂ in the ambient air is communicated to the microcontroller or microprocessor, and wherein the microcontroller or microprocessor causes the system to generate the ClO₂ if the ClO₂ concentration is below a target value.

21. The system of claim 15, wherein the system comprises one reagent container and one reagent, wherein the device for generating the ClO₂ is a electrochemical generator, and wherein the electrochemical generator uses an electrical potential to cause a reaction with the reagent that generates the ClO₂.

22. The system of claim 21, wherein the electrochemical generator is a microfluidic device.

23. The system of claim 15, further comprising a barometric sensor to sense a pressure of ambient air introduced via the inlet, wherein the pressure is communicated to the microcontroller or microprocessor, and wherein a negative pressure causes the microcontroller or microprocessor to pause ClO₂ generation until a neutral and/or positive pressure is sensed by the barometric sensor.

24. The system of claim 15, further comprising an off-gas and waste chamber having a membrane, wherein waste from the generation of the ClO₂ is absorbed in an absorber material, and wherein ClO₂ exits the off-gas and waste chamber through the membrane and into an ambient atmosphere.

25. The system of claim 15, further comprising an air pump electrically connected to the microcontroller or microprocessor and fluidically connected to the inlet via an air duct.

26. The system of claim 15, wherein the microcontroller or microprocessor is controlled by machine learning algorithms to alter system performance.

27. The system of claim 15, wherein the microcontroller or microprocessor is controlled by artificial intelligence algorithms to alter system performance.
28. The system of claim 26 or 27, wherein the microcontroller or microprocessor alters system performance automatically.
29. The system of claim 26 or 27, wherein the microcontroller or microprocessor alters system performance by control by a user.
30. The system of claim 26 or 27, wherein the microcontroller or microprocessor alters the system performance based upon at least one of:
- a detection of a virus in ambient air containing the system;
 - a detection of bacteria in ambient air containing the system;
 - an altitude of the system;
 - a temperature of the system;
 - changes in ambient air measured by changes in a concentration of ClO₂ in ambient air;
 - changes in occupancy by living beings of an area containing the system;
 - alterations for a user's preferences;
 - prediction of cycles of occupancy and vacancy by living beings of the area containing the system; and
 - a diagnosis of normal or abnormal performance of the system.
31. A network of systems for generating and monitoring ClO₂, comprising:
- a plurality of systems for generating and monitoring ClO₂, including:
 - a device housing including an inlet;
 - a microcontroller;
 - a reagent container containing a reagent;
 - a microfluidic device for generating a ClO₂ from the reagent; and
 - a sensing system;
 - wherein the microcontroller includes a communication device capable of communication between the plurality of systems,
 - wherein the communication device establishes distributed control of each system's microcontroller, and
 - wherein the microcontroller is controlled by machine learning algorithms to alter system performance.
32. The network of systems of claim 31, wherein the distributed control includes at least one of:

adjusting individual systems to achieve a uniform or deliberately non-uniform distribution of ClO₂ in each individual sensor's location within a specified space;
consumption of ClO₂;
control of day and/or night generation cycles;
using the sensing system to sense patterns across time, three-dimensional volumes, seasonal variations;
sending patterns that are inferred or traced to a signal measured; and
sensing patterns that are directly traceable to variations observed in ClO₂ concentrations across the network of systems installed across distinct spaces.

33. A network of systems for generating and monitoring ClO₂ concentration, comprising:

a plurality of systems for generating and monitoring ClO₂, including:
a device housing including an inlet;
a microcontroller;
a reagent container containing a reagent;
a microfluidic device for generating a ClO₂ from the reagent; and
a sensing system;

wherein the microcontroller includes a communication device capable of communication between the plurality of systems,

wherein the communication device establishes distributed control of each system's microcontroller, and

wherein the microcontroller is controlled by artificial intelligence algorithms to alter system performance.

34. The network of systems of claim 33, wherein the distributed control includes at least one of:

adjusting individual systems to achieve a uniform or deliberately non-uniform distribution of ClO₂ in each individual sensor's location within a specified space;
consumption of ClO₂;
control of day and/or night generation cycles;
using the sensing system to sense patterns across time, three-dimensional volumes, seasonal variations;
sending patterns that are inferred or traced to a signal measured; and
sensing patterns that are directly traceable to variations observed in ClO₂ concentrations across the network of systems installed across distinct spaces.