CLAIMS

What is claimed is:

1. A system for sulfide removal from water or wastewater, comprising:

a manifold structure including one or more openings to flow air out of an interior of the manifold structure;

one or more support structures connected to the manifold structure, wherein the one or more support structures are floatable on a surface of a fluid including water or wastewater; and

an air source configured to supply air to the manifold structure to be flowed out from the manifold structure through the one or more openings at the fluid to facilitate sulfide in the fluid to oxidize,

wherein the air flowed out of the interior manifold structure includes an amount of oxygen gas comprising less than 0.1 mg/L of oxygen (O_2).

2. The system of claim 1, wherein the system is operable to flow the air at a top surface of the fluid to a shallow depth within a range of 0 cm to 5 cm within the fluid.

3. The system of any one of claims 1 to 2, wherein the manifold structure includes multiple channels for the air to flow out of the interior of the manifold structure.

4. The system of any one of claims 1 to 3, wherein the sulfide is oxidized to elemental sulfur and removed from the water or wastewater solution.

5. The system of any one of claims 1 to 4, wherein the air source includes a pump.

6. The system of claim 5, wherein the pump is connected to a tube that supplies air to the manifold structure.

7. The system of any one of claims 1 to 6, further comprising:

a flow meter to control a rate of air flow.

8. The system of any one of claims 1 to 7, wherein the manifold structure includes a ring geometry or a polygon geometry.

9. The system of any one of claims 1 to 8, wherein the manifold structure includes a plurality of tube structures spanning from a feed tube, where the one or more openings are disposed on the tube structures to flow air out of the interior of the tube structure.

10. The system of any one of claims 1 to 9, further comprising:
a support material coupled to the manifold structure to facilitate growth of sulfide-oxidizing bacteria to create a biofilm.

11. The system of claim 10, wherein the support material includes a perforated carbon textile, a plastic mesh, or a perforated foam.

12. The system of any one of claims 10 to 11, wherein the support material is configured to float on the surface of the fluid.

13. The system of any one of claims 9 to 12, wherein the support material includes a plurality of openings such that the support material has an open structure up to 90% of the structure.

14. The system of any one of claims 1 to 13, wherein the one or more openings of the manifold structure are configured to provide uniform air distribution on the surface of the fluid.

15. The system of any one of claims 1 to 14, wherein the manifold structure includes a flexible tubing.

16. The system of any one of claims 1 to 15, wherein the manifold structure includes a rigid tubing.

17. The system of any one of claims 1 to 16, wherein the one or more support structures is porous, biocompatible, and/or inert in water.

18. The system of any one of claims 1 to 17, wherein the one or more support structures includes a foam.

19. The system of any one of claims 1 to 18, comprising:
a container to hold the fluid.

20. The system of claim 19, wherein the container is interfaced with an inlet line through which the fluid can flow into the container and an outlet line through which, once treated, the fluid can flow out of the container.

21. The system of any one of claims 1 to 20, wherein the manifold structure is raised above the fluid by the one or more supporting structures such that the one or more openings of the manifold structure does not contact the fluid.

22. The system of any one of claims 1 to 21, wherein the manifold structure, the one or more support structures, and the air source are contained within a single unit.

23. The system of any one of claims 1 to 22, wherein the water or wastewater includes sewage received from a domestic infrastructure system, agricultural system, or industrial system.

24. The system of any one of claims 1 to 23, wherein the fluid containing the water or wastewater is contained within a vessel and the one or more support structures are floatable on the surface the fluid in the vessel.

25. The system of any one of claims 1 to 24, wherein the system is configured to feed an output fluid from the system to a microbial fuel cell (MFC) reactor.

26. A method of removing sulfide from a fluid containing water or wastewater, the method comprising:

contacting a fluid containing water or wastewater with a manifold structure that includes one or more openings to flow air out of an interior of the manifold structure, wherein the manifold structure is positioned with respect to the fluid based on one or more support structures connected to the manifold structure and configured to float on the fluid;

flowing air out of the interior of the manifold structure to supply an amount of oxygen gas comprising less than 0.1 mg/L of oxygen (O_2) to the fluid; and

converting the sulfide of the fluid to elemental sulfur.

27. The method of claim 26, wherein the fluid includes sulfide-oxidizing bacteria.

28. The method of any one of claims 26 to 27, wherein the flowing the air out of the interior of the manifold structure includes supplying the amount of oxygen gas comprising less than 0.1

mg/L of O_2 at a top surface of the fluid to a shallow depth within a range of 0 cm to 5 cm within the fluid.

29. The method of any one of claims 26 to 28, comprising regulating air flow with a flow meter for flowing air out of the interior of the manifold structure.

30. The method of claim 29, wherein the air flow is regulated such that a concentration of oxygen introduced into the fluid containing the water or wastewater does not exceed about 0.1 mg/L.

31. The method of any one of claims 26 to 30, comprising providing a support material coupled to the manifold structure to facilitate growth of sulfide-oxidizing bacteria on the support material to create a biofilm.

32. The method of any one of claims 26 to 31, wherein the method does not convert sulfide to sulfate, thiosulfate, or combination thereof.

33. The method of any one of claims 26 to 32, wherein the sulfide is hydrogen sulfide.

34. The method of any one of claims 26 to 33, wherein the manifold structure is raised above the fluid by the one or more supporting structures such that the one or more openings of the manifold structure does not contact the fluid.

35. The method of any one of claims 26 to 34, wherein the manifold structure is positioned with respect to the fluid by the one or more supporting structures such that the one or more openings of the manifold structure contact the fluid at a surface of the fluid or are at least partially submerged in the fluid.

36. The method of any one of claims 26 to 35, wherein the method is implemented by the system of any one of claims 1 to 25.