Claims

1. A water purification and/or disinfection device, comprising:

at least one treatment vessel;

at least one UVA light source arranged to supply UVA light to an interior portion of the at least one treatment vessel; and

at least one UVC light source arranged to supply UVC light to an interior portion of the at least one treatment vessel, wherein

the at least one UVA light source and the at least one UVC light source are adapted such that a water for purification and/or disinfection is sequentially treated with a dose of UVA light followed by a dose of UVC light, optionally wherein the dose of UVC light may be accompanied by a further dose of UVA light.

2. The device of Claim 1, wherein the at least one treatment vessel comprises at least one first treatment vessel and at least one second treatment vessel, where the at least one UVA light souce is arranged to supply light to an interior portion of the at least one first treatment vessel and the at least one UVC light source is arranged to supply light to an interior portion of the at least one second treatment vessel.

3. The device of Claim 2, wherein the at least one first treatment vessel is in fluid communication with the at least one second vessel, such that a water for purification and/or disinfection is supplied in sequence to the first treatment vessel and then to the second treatment vessel.

4. The device of any one of the preceding claims, wherein the interior portion of the at least one treatment vessel comprises an outer section and an inner section separated by a filter, such that water must pass through the inner section to reach the outer section, or *vice versa*, optionally wherein the filter is a ceramic filter.

5. The device of any one of the preceding claims, wherein:

(a) a photocatalyst is supported on at least one surface of the interior portion of the at least one treatment vessel, optionally wherein the photocatalyst comprises titanium dioxide doped with silver, optionally wherein the photocatalyst comprises from 2 to 10 wt% silver relative to 100 wt% TiO_2; and/or

(b) the UVA light is provided at a wavelength of from 330 to 380 nm (e.g. 365 nm) and/or the UVC light is provided at a wavelength of from 230 to 280 nm (e.g. 265 nm).

6. The device of any one Claims 2 to 5, wherein the at least one second treatment vessel further comprises at least one UVA light source that is arranged to supply light to an interior portion of the at least one second treatment vessel.

7. The device of any one of the preceding claims, wherein:

(a) the UVA light source is a UVA LED and/or the UVC light source is a UVC LED; and/or

(b) the dose of UVA light is sub-lethal to a bacteria present in a water supplied to the device for purification and/or disinfection, optionally wherein the dose of UVA light in the first vessel is sub-lethal to a bacteria present in a water supplied to the first vessel; and/or

(c) the dose of UVC light is lethal to a bacteria present in a water supplied to the device for purification and/or disinfection, optionally wherein the dose of UVC light in the second vessel is lethal to a bacteria present in a water supplied to the first vessel; and/or

(d) the at least one treatment vessel is a quartz vessel.

8. The device of any one of the preceding claims, wherein the at least one UVA light source is adapted to be operated in a continuously lit mode and/or a periodically lit mode operating on a microsecond-scale on/off pulse, optionally wherein the periodically lit mode involves a 100 ms cycle time the 100 ms cycle time optionally involves 20 ms on and 80 ms off.

9. The device of any one of Claims 6 to 8, wherein the at least one UVC light source is adapted to be operated in a continuously lit mode and/or a periodically lit mode operating on a microsecond-scale on/off pulse.

10. A method for water purification and/or disinfection comprising the steps of:

(a) supplying a water for purification and/or disinfection;

(b) subjecting the water for purification and/or disinfection to a dose of UVA light supplied by a UVA light source; and

(c) subsequently subjecting the water for purification and/or disinfection to a dose of UVC light supplied by a UVC light source, optionally the UVC dose is accompanied by a further dose of UVA light supplied by the same or a different UVA light source.

11. The method of Claim 10, wherein:

the method is conducted in a batch fashion using a single treatment vessel or using a first treatment vessel where the water for purification is subjected to UVA light and a second treatment vessel where the water for purification is subjected to UVC light; or

the method is conducted in a flow system having a first treatment vessel and a second treatment vessel, where the water for purification is subjected to UVA light in the first vessel and the water for purification is subjected to UVC light in the second vessel.

12. The method of Claim 10 or Claim 11, wherein the water for purification is subjected to filtration before being subjected to UVA light.

13. The method of any one of Claims 11 or Claim 12, wherein an inner surface of the vessel supports a photocatalyst, optionally wherein:

(a) the photocatalyst comprises titanium dioxide doped with silver; and/or

(b) the photocatalyst comprises from 2 to 10 wt% silver relative to 100 wt% TiO_2.

14. The method of any one of Claims 10 to 13, wherein the UVA light is provided at a wavelength of from 330 to 380 nm (e.g. 365 nm) and/or the UVC light is provided at a wavelength of from 230 to 280 nm (e.g. 265 nm).

15. The method of any one of Claims 11 to 14, wherein the at least one second treatment vessel further subjects the water for purification to UVA light.

16. The method of any one of Claims 10 to 15, wherein:

(a) the dose of UVA light is sub-lethal to a bacteria present in a water supplied to the device for purification and/or disinfection, optionally wherein the dose of UVA light in the first vessel is sub-lethal to a bacteria present in a water supplied to the first vessel; and/or

(b) the dose of UVC light is lethal to a bacteria present in a water supplied to the device for purification and/or disinfection, optionally wherein the dose of UVC light in the second vessel is lethal to a bacteria present in a water supplied to the first vessel; and/or

(c) the method is conducted using a device according to any one of Claims 1 to 9.

17. The method of any one of Claims 10 to 16, wherein the UVA light source is a UVA LED and/or the UVC light source is a UVC LED.

18. The method of any one of Claims 10 to 17, wherein the at least one UVA light source is adapted to be operated in a continuously lit mode and/or a periodically lit mode operating on a microsecond-scale on/off pulse.

19. The method of Claim 18, wherein the periodically lit mode involves a 100 ms cycle time, optionally wherein the 100 ms cycle time involves 20 ms on and 80 ms off.

20. The method of any one of Claims 17 to 19, wherein the at least one UVC light source is adapted to be operated in a continuously lit mode and/or a periodically lit mode operating on a microsecond-scale on/off pulse.