What is claimed is:

CLAIMS

1. An electrochemical water treatment device, comprising:

a feed inlet fluidly connectable to a source of water including dissolved silica and a chlorine-containing compound; and

an electrochemical separation module fluidly connectable to the feed inlet, the electrochemical separation module comprising a dilution compartment, a concentration compartment, an ion exchange membrane positioned between the dilution compartment and the concentration compartment, and first and second electrodes,

a first portion of a volume of the dilution compartment including a first ion exchange media positioned proximate to the feed inlet and,

a second portion of the volume of the dilution compartment including a second ion exchange media positioned distal to the feed inlet, the first ion exchange media having a greater resistance to the chlorine-containing compound than the second ion exchange media,

wherein the first ion exchange media comprises a mixture of two or more ion exchange media comprising a mixture of at least one cation exchange media and at least one anion exchange media and wherein the at least one anion exchange media of the first ion exchange media has a lower moisture content than the at least one anion exchange media of the second ion exchange media.

2. The device of claim 1, further comprising a product outlet fluidly connected downstream of dilution compartment of the electrochemical separation module.

3. The device of claim 1, wherein the first ion exchange media resists swelling due to absorption of the chlorine-containing compound to a greater extent relative to the second ion exchange media.

4. The device of claim 3, wherein the first portion occupies about 10% to about 30% of the volume of the dilution compartment.

5. The device of claim 4, wherein the second portion about 70% to about 90% of the volume of the dilution compartment.

6. The device of claim 1, wherein one of the at least one cation exchange media and at least one anion exchange media has a moisture content of between about 40-50%.

7. The device of claim 6, wherein the at least one anion exchange media has the moisture content of between about 40-50%.

8. The device of any one of claims 1-7, wherein the first ion exchange media can resist the chlorine-containing compound present at a concentration of about 0.01 ppm to about 0.10 ppm over a period of time.

9. The device of claim 1, wherein the first ion exchange media further comprises up to about 10% v/v of an adsorbent.

10. The device of claim 1, wherein the second ion exchange media comprises an ion exchange media suitable for the removal of the dissolved silica in water from the source of water.

11. The device of claim 10, wherein the second ion exchange media comprises a mixture of two or more ion exchange media.

12. The device of claim 11, wherein the mixture of two or more ion exchange media comprises a mixture of at least one cation exchange media and at least one anion exchange media.

13. The device of claim 12, wherein one of the at least one cation exchange media and at least one anion exchange media has a moisture content of between about 50-60%.

14. The device of claim 13, wherein the at least one anion exchange media has the moisture content of between about 50-60%.

15. The device of any one of claims 1-14, wherein at least one of the first ion exchange media and second ion exchange media comprises a microporous resin, a macroporous resin, or a cross-linked gel.

16. The device of any one of claims 1-15, wherein a volume of the concentration compartment comprises a third ion exchange media having a composition substantially similar to the first ion exchange media.

17. The device of claim 1, wherein the electrochemical separation module comprises a plurality of dilution compartments and a plurality of concentration compartments separated by an alternating series of cation exchange membranes and anion exchange membranes.

18. A method of reducing the concentration of dissolved silica in water, the method comprising:

directing a feed stream from a source of water including dissolved silica and a chlorine-containing compound to a feed inlet of an electrochemical separation module in an electrochemical water treatment device, the electrochemical separation module comprising:

a dilution compartment, a concentration compartment, an ion exchange membrane positioned between the dilution compartment and the concentration compartment, and first and second electrodes,

a first portion of a volume of the dilution compartment including a first ion exchange media positioned proximate to the feed inlet and,

a second portion of the volume of the dilution compartment including a second ion exchange media positioned distal to the feed inlet, the first ion exchange media having a greater resistance to the chlorine-containing compound than the second ion exchange media which corresponds to a higher degree of cross-linking, a lower moisture (or water) content and a lower propensity of swelling, than the at anion exchange media of the second ion exchange media; and

applying a voltage across the first and second electrodes to produce a product stream having a reduced concentration of dissolved silica and a concentrate stream enriched in dissolve ed silica.

19. The method of claim 18, wherein directing the feed stream from the source of water to be treated includes directing water having a dissolved silica concentration of about 1 ppm.

20. The method of claim 18, further comprising discharging a product stream having a dissolved silica concentration of about 1 ppb.

21. A method of facilitating treatment of water containing dissolved silica, the method comprising:

providing an electrochemical water treatment device connectable to a source of water containing dissolved silica and a chlorine-containing compound, the electrochemical water treatment device including an electrochemical separation module comprising:

a feed inlet, a dilution compartment, a concentration compartment, an ion exchange membrane positioned between the dilution compartment and the concentration compartment, and first and second electrodes, a first portion of a volume of the dilution compartment including a first ion exchange media positioned proximate to the feed inlet and a second portion of the volume of the dilution compartment including a second ion exchange media positioned distal to the feed inlet, the first ion exchange media having a greater resistance to the chlorine-containing compound than the second ion exchange media which corresponds to a higher degree of cross-linking, a lower moisture (or water) content and a lower propensity of swelling, than the at anion exchange media of the second ion exchange media;

providing instructions to direct wastewater from the source of water to the feed inlet of the electrochemical separation module; and

providing instructions to apply a voltage across the first and second electrodes to produce a product stream with a reduced concentration of dissolved silica and a concentrate stream enriched in dissolved silica.