CLAIMS

1. A water treatment system, comprising:

a feed inlet fluidly connected to a source of water to be treated;

a first electrochemical separation module in fluid communication with the feed inlet, the first electrochemical separation module including at least one ion exchange membrane having a first set of performance characteristics;

a second electrochemical separation module fluidly connected to a diluted stream from the first electrochemical separation module, the second electrochemical separation module including a least one ion exchange membrane having a second set of performance characteristics that is different than the first set of performance characteristics; and

a product outlet fluidly connected to a diluted stream from the second electrochemical separation module, wherein the at least one ion exchange membrane of the first electrochemical separation module has a lower electrical resistance, a lower permselectivity, and a higher water loss coefficient than the at least one ion exchange membrane of the second electrochemical separation module.

2. The system of claim 1, wherein the at least one ion exchange membrane of the first electrochemical separation module having the first set of performance characteristics is at least one anion exchange membrane, and wherein the at least one ion exchange membrane of the second electrochemical separation module having the second set of performance characteristics is at least one anion exchange membrane.

3. The system of claim 1, wherein the at least one ion exchange membrane of the first electrochemical separation module having the first set of performance characteristics is at least one cation exchange membrane, and wherein the at least one ion exchange membrane of the second electrochemical separation module having the second set of performance characteristics is at least one cation exchange membrane.

4. The system of claim 1, wherein the first and second electrochemical separation modules are electrodialysis devices.

5. The system of claim 1, wherein the first and second electrochemical separation modules are electrodeionization devices.

6. The system of claim 1, further comprising a third electrochemical separation module fluidly connected between the first and second electrochemical separation modules, the third electrochemical separation module including at least one ion exchange membrane having a third set of performance characteristics that is different than the first and second sets of performance characteristics.

7. A method of treating water, comprising:

introducing water having a first concentration of dissolved solids to an inlet of a first electrochemical separation module of the water treatment system of any of claims 1-4 to form a process stream having a second concentration of dissolved solids, the first electrochemical separation module including at least one ion exchange membrane having a first set of performance characteristics;

introducing the process stream having the second concentration of dissolved solids to a second electrochemical separation module of said water treatment system to form treated water, the second electrochemical separation module including at least one ion exchange membrane having a second set of performance characteristics that is different than the first set of performance characteristics; and

collecting the treated water at an outlet of the second electrochemical separation module.