WHAT IS CLAIMED IS:

1. An electrical connector connected to a power source, the electrical connector comprising:

an electrically insulating body;

a self-passivating contact comprising a first electrically conductive material that forms an electrically insulating passivation layer when exposed to water; and

a non-passivating contact comprising a second electrically conductive material that is unreactive when exposed to water,

wherein the self-passivating contact is held at a higher voltage than the non-passivating contact by the power source.

2. The electrical connector of claim 1, wherein the first electrically conductive material includes a transition metal, and the electrically insulating passivation layer is an oxide formed from the transition metal.

3. The electrical connector of claim 2, wherein the first electrically conductive material is an outer layer of the self-passivating contact.

4. The electrical connector of claim 2, wherein the transition metal is selected from a group containing niobium, tantalum, titanium, zirconium, molybdenum, ruthenium, rhodium, palladium, hafnium, tungsten, rhenium, osmium, and iridium.

5. The electrical connector of claim 1, wherein the second electrically conductive material is resistant to corrosion in an aqueous environment.

6. The electrical connector of claim 5, wherein the second electrically conductive material includes copper, silver, gold, platinum, graphite, or aluminum.

7. The electrical connector of claim 1, wherein the electrically insulating passivation layer prevents electrical current from flowing from the self-passivating contact to the non-passivating contact when exposed to water.

8. A system comprising:

a first electrical connector comprising:

a first self-passivating contact formed with a self-passivating electrically conductive material that forms an electrically insulating passivation layer when exposed to water; and

a first non-passivating contact formed with a non-passivating, electrically conductive material that is unreactive when exposed to water;

a second electrical connector comprising:

a second self-passivating contact configured to mate with the first self-passivating contact, the second self-passivating contact formed with the self-passivating electrically conductive material; and

a second non-passivating contact configured to mate with the first non-passivating contact, the second non-passivating contact formed with the non-passivating, electrically conductive material; and

a power source configured to hold the first self-passivating contact at a higher voltage than the first non-passivating electrode.

9. The system of claim 8, wherein the self-passivating, electrically conductive material includes a transition metal, and the electrically insulating passivation layer is an oxide formed from the transition metal.

10. The system of claim 9, wherein the transition metal is selected from a group containing niobium, tantalum, titanium, zirconium, molybdenum, ruthenium, rhodium, palladium, hafnium, tungsten, rhenium, osmium, and iridium.

11. The system of claim 8, wherein the non-passivating, electrically conductive material is resistant to corrosion in an aqueous environment.

12. The system of claim 11, wherein the non-passivating, electrically conductive material includes copper, silver, gold, platinum, graphite, or aluminum.

13. The system of claim 8, wherein the electrically insulating passivation layer prevents electrical current from flowing from the first self-passivating contact to the first non-passivating contact when exposed to water.

14. The system of claim 8, wherein the second self-passivating contact is configured to scrape at least a portion of the electrically insulating passivation layer when mating with the first self-passivating contact, enabling current to flow between the first self-passivating contact and the second self-passivating contact.

15. A method comprising:

forming a connector body from an electrically insulating material;

forming a self-passivating anode comprising a first electrically conductive material that forms an electrically insulating passivation layer when exposed to water; and

forming a non-passivating cathode comprising a second electrically conductive material that is unreactive when exposed to water; and

installing the self-passivating anode and the non-passivating cathode in the connector body,

wherein the electrically insulating passivation layer prevents electrical current from flowing from the self-passivating anode to the non-passivating cathode when exposed to water.

16. The method of claim 15, wherein forming the self-passivating anode comprises forming a transition metal as the first electrically conductive material, and wherein the electrically insulating passivation layer is an oxide formed from the transition metal.

17. The method of claim 16, wherein forming the self-passivating anode comprises selecting the transition metal from a group containing niobium, tantalum, titanium, zirconium, molybdenum, ruthenium, rhodium, palladium, hafnium, tungsten, rhenium, osmium, and iridium.

18. The method of claim 15, wherein forming the self-passivating anode comprises coating an anode formed from the second electrically conductive material with a layer of the first electrically conductive material.

19. The method of claim 15, wherein forming the non-passivating cathode comprises forming a metal that is resistant to corrosion in an aqueous environment as the second electrically conductive material.

20. The method of claim 19, wherein forming the non-passivating cathode comprises selecting the second electrically conductive material to include copper, silver, gold, platinum, graphite, or aluminum.