CLAIMS

1. A chlorination electrolyser comprising:
   - a housing provided with an inlet and an outlet suitable for the circulation of brine;
   - at least one pair of bipolar electrodes facing each other and positioned within said housing;

   characterised in that each bipolar electrode of said at least one pair comprises:
   - a valve metal substrate;
   - an active coating comprising at least one layer of a catalytic composition of a solid solution comprising ruthenium and titanium disposed over said substrate;
   - a top coating comprising at least one layer of a composition comprising oxides of tantalum, niobium, tin, or combinations thereof disposed over said active coating.
2. A chlorination electrolyser comprising:
   - a housing provided with an inlet and an outlet suitable for the circulation of brine;
   - at least one pair of bipolar electrodes facing each other and positioned within said housing;

   characterised in that each bipolar electrode of said at least one pair comprises:
   - a valve metal substrate;
   - an active coating comprising at least one layer of a catalytic composition comprising ruthenium and titanium disposed over said substrate;
   - a top coating comprising at least one layer of a composition comprising oxides of tin disposed over said active coating, wherein said top coating does not comprise oxides of tantalum or niobium.
3. The chlorination electrolyser according to any one of claims 1 or 2, wherein said

catalytic composition comprises 25%-45% ruthenium and 55%-75% titanium expressed in weight percentage with respect to the elements.

4. The chlorination electrolyser according to claim 3, wherein said catalytic composition further comprises 2%-5% of doping elements selected from the group consisting of scandium, strontium, hafnium, bismuth, zirconium, aluminium, copper, rhodium, iridium, platinum, palladium and their mutual combinations.

5. The chlorination electrolyser according to any one of claims 1-4 wherein said active coating has a load of ruthenium of 1-30 g/m^2.

6. The chlorination electrolyser according to any one of claims 1-5, wherein said top coating consists of tin oxide.

7. The chlorination electrolyser according to any one of claims 1-6, wherein said top coating has a thickness of 0,5-7 microns.

8. The chlorination electrolyser according to any one of claims 1-7, wherein said top coating has a total load of 2-6 g/m^2.

9. The chlorination electrolyser according to any one of claims 1-8, wherein said valve metal substrate is titanium.

10. A self-cleaning electrochlorination system comprising:

- the chlorination electrolyser according to any one of claims 1-9;
- an electrolyte comprising a 1-30 g/l NaCl brine solution circulating within said chlorination electrolyser;
- an electronic system for periodically reversing the polarity of the at least one pair of bipolar electrodes and electrically connected thereto.

11. A method for the production of the chlorination electrolyser according to claim 1, comprising the step of manufacturing each electrode of the at least one pair of bipolar electrodes in accordance with the following sequential passages:

a) apply an active coating solution comprising precursors of ruthenium and

titanium to a valve metal substrate thus obtaining a coated substrate;

b) bake the coated substrate for 2-10 minutes at a temperature of 450-550°C to form a solid solution comprising ruthenium and titanium;

c) repeat steps a) and b) until achieving the desired load of ruthenium;

d) apply a top coating solution comprising precursors of tantalum, niobium, tin, or combinations thereof to the coated substrate;

e) bake the coated substrate for 2-10 minutes at a temperature of 450-550°C;

f) repeat steps d) and e) until achieving the desired load of tantalum, niobium, tin or their combination;

g) perform a final thermal treatment at a temperature in the range of 450-550°C;

wherein said precursors of ruthenium and titanium and said precursors of tantalum, niobium or tin are compounds selected from the group consisting of methoxides, ethoxides, propoxides, butoxides, chlorides, nitrates, iodides, bromides, sulfates or acetates of the metals and mixtures thereof.

12. A method for the production of the chlorination electrolyser according to claim 2, comprising the step of manufacturing each electrode of the at least one pair of bipolar electrodes in accordance with the following sequential passages:

a) apply an active coating solution comprising precursors of ruthenium and titanium to a valve metal substrate thus obtaining a coated substrate;

b) bake the coated substrate for 2-10 minutes at a temperature of 450-550°;

c) repeat steps a) and b) until achieving the desired load of ruthenium;

d) apply a top coating solution comprising precursors of tin to the coated substrate, wherein said top coating solution not comprise oxides of tantalum or niobium;

e) bake the coated substrate for 2-10 minutes at a temperature of 450-550°C;

f) repeat steps d) and e) until achieving the desired load of tin;

g) perform a final thermal treatment at a temperature in the range of 450-550°C;

wherein said precursors of ruthenium and titanium and said precursors of tin are compounds selected from the group consisting of methoxides, ethoxides, propoxides, butoxides, chlorides, nitrates, iodides, bromides, sulfates or acetates of the metals and mixtures thereof.

13. Use of the chlorination electrolyser according to claims 1-9 in normal and low salinity pools for hypochlorite mediated water disinfection.

14. A method for hypochlorite-mediated water disinfection comprising the steps of

a) circulating an electrolyte comprising 1-30 g/l NaCl brine solution within at least one chlorination electrolyser according to any one of claims 1-9, said chlorination electrolyser comprising one or more bipolar electrode pairs;

b) applying an electrical current onto said bipolar electrode pairs to produce hypochlorite in said brine solution;

c) periodically reversing the polarity of the at least one pair of bipolar electrodes during application of said electrical current.

15. The method of claim 14, wherein the polarity of said at least one pair of bipolar electrodes is reversed at time intervals selected from a range of one minute to 20 hours.

16. The method of one claims 14 or 15, wherein the electrical current is applied onto said at least one pair of bipolar electrodes pairs at a current density selected from a range of 200 to 600 A/m^2.