CLAIMS

1. A method of manufacturing an electrochromic device, the method comprising

a) providing a transparent electrode, wherein the transparent electrode is formed of lines of an electrically conductive material surrounding one or more of two-dimensional voids of various shapes, wherein the electrically conductive material is free of ITO and wherein the one or more of two-dimensional voids of various shapes do not contain an electrically conductive material, wherein one or more layers of an electrochromic material is applied to the transparent electrode, wherein at least a portion of the electrochromic material is in direct contact with the lines of the electrically conductive material of the transparent electrode, and wherein the lines of the electrically conductive material of the transparent electrode overlap with about 5 % to about 15 % by area of the electrochromic material;

b) providing a counter-electrode; and

c) providing an electrolyte, wherein the electrolyte is arranged to ionically connect the transparent electrode comprising the at least a portion of the electrochromic material in direct contact with the lines of the electrically conductive material and the counter-electrode.

2. The method according to claim 1, wherein providing the transparent electrode comprises chemically sintering the lines of the electrically conductive material of the transparent electrode.

3. The method according to claim 1, wherein the lines of the electrically conductive material are arranged to form a grid pattern.

4. The method according to claim 1, wherein the transparent electrode formed of the lines of the electrically conductive material surrounding one or more of two-dimensional voids of various shapes is formed directly on the one or more layers of the electrochromic material.

5. The method according to claim 1, wherein the one or more layers of the electrochromic material is applied in a second patterned arrangement to the transparent electrode.

6. The method according to claim 1, further comprising applying a second patterned arrangement of an electrically conductive material which is free of ITO as a second transparent electrode on the one or more layers of the electrochromic material.

7. The method according to claim 1, wherein applying the one or more layers of the electrochromic material to the transparent electrode comprises applying an electrochromic ink composition comprising

a) about 0.05 wt% to about 60 wt% of the electrochromic material;

b) about 40 wt% to about 95 wt% of a liquid vehicle;

c) about 0.01 wt% to about 20 wt% of a physicochemical modifier; and

d) about 0.01 wt% to about 20 wt% of an additive;

wherein respective wt% are calculated based on total weight of the composition and sum of the respective wt% is 100 wt%, to the transparent electrode.

8. The method according to claim 7, wherein the liquid vehicle is selected from the group consisting of ethylene glycol, diethylene glycol, diethylene glycol n-butyl ether, diethylene glycol n-butyl ether acetate, diethylene glycol ethyl ether, diethylene glycol ethyl ether acetate, diethylene glycol methyl ether, dipropylene glycol butyl ether, dipropylene glycol methyl ether, dipropylene glycol methyl ether acetate, ethylene glycol dibutyrate, and combinations thereof.

9. The method according to claim 7, wherein the liquid vehicle further comprises a liquid selected from the group consisting of an aqueous solution, water, ethanol, isopropyl alcohol, ethylene glycol, propylene glycol, n methyl pyrrolidone, terpinol, dipropylene glycol methyl ether (DPM), dipropylene glycol methyl ether acetate (DPMA), and combinations thereof.

10. The method according to claim 7, wherein the physicochemical modifier is selected from the group consisting of a surfactant, a polymer, a co-solvent, a viscosity modifier, a surface tension modifier, an evaporation rate control agent, and combinations thereof.

11. The method according to claim 7, wherein the additive is selected from the group consisting of a binder, a pH control agent, an antimicrobial agent, and combinations thereof.

12. A method of manufacturing an electrochromic device, the method comprising

a) providing a transparent electrode, wherein the transparent electrode is formed of lines of an electrically conductive material surrounding one or more of two-dimensional voids of various shapes, wherein the electrically conductive material is free of ITO and wherein the one or more of two-dimensional voids of various shapes do not contain an electrically conductive material, wherein providing the transparent electrode comprises applying a dispersion comprising the electrically conductive material to a template arranged on a substrate, and forming the lines of the electrically conductive material on the substrate by self-assembly, wherein one or more layers of an electrochromic material is applied to the transparent electrode, wherein at least a portion of the electrochromic material is in direct contact with the lines of the electrically conductive material of the transparent electrode, and wherein the lines of the electrically conductive material of the transparent electrode overlap with about 5 % to about 15 % by area of the electrochromic material;

b) providing a counter-electrode; and

c) providing an electrolyte, wherein the electrolyte is arranged to ionically connect the transparent electrode comprising the at least a portion of the electrochromic material in direct contact with the lines of the electrically conductive material and the counter-electrode.

13. An electrochromic device comprising

a) a transparent electrode formed of (i) lines of an electrically conductive material surrounding one or more of two-dimensional voids of various shapes,

wherein the electrically conductive material is free of ITO and wherein the one or more of two-dimensional voids of various shapes do not contain an electrically conductive material, wherein the lines of the electrically conductive material are formed on a substrate by self-assembly of a dispersion comprising the electrically conductive material applied to a template arranged on the substrate, and (ii) one or more layers of an electrochromic material, wherein at least a portion of the electrochromic material is in direct contact with the lines of the electrically conductive material of the transparent electrode, and wherein the lines of the electrically conductive material of the transparent electrode overlap with about 5 % to about 15 % by area of the electrochromic material;

b) a counter-electrode; and

c) an electrolyte, wherein the electrolyte is arranged to ionically connect the transparent electrode comprising the at least a portion of the electrochromic material in direct contact with the lines of the electrically conductive material and the counter-electrode.

14. The electrochromic device according to claim 13, wherein the lines of the electrically conductive material are arranged to form a grid pattern.

15. The electrochromic device according to claim 13, wherein the one or more layers of the electrochromic material is in a second patterned arrangement.

16. The electrochromic device according to claim 13, further comprising a second patterned arrangement of an electrically conductive material which is free of ITO as a second transparent electrode and arranged in electrical contact with the one or more layers of an electrochromic material.