CLAIMS

The invention claimed is:

1. A benefit agent delivery system comprising:

a conductive layer;

a microcell layer comprising a plurality of microcells, wherein each microcell includes an opening, and wherein a medium comprising a carrier and a benefit agent is contained in the plurality of microcells;

a sealing layer spanning the opening of each microcell and comprising a polymeric material and a metallic material;

an electrode layer; and

a voltage source that is coupled to the conductive layer and the electrode layer,

wherein the conductive layer, the microcell layer, the sealing layer and the electrode layer are vertically stacked upon each other; and

wherein the microcell layer and the sealing layer are disposed between the conductive layer and the electrode layer.

2. A benefit agent delivery system of claim 1, wherein, when a voltage is applied from the voltage source between the conductive layer and the electrode layer, the metallic material is removed from the sealing layer, creating a porous the sealing layer.

3. The benefit agent delivery system of claim 1, wherein the conductive layer, the microcell layer, the sealing layer and the electrode layer are vertically stacked upon each other in this order, and wherein the electrode layer is porous.

4. The benefit agent delivery system of claim 1, wherein the polymeric material of the sealing layer is selected from the group consisting of an acrylate, a methacrylate, a polycarbonate, a polyvinyl alcohol, cellulose, poly(N-isopropylacrylamide) (PNIPAAm), poly(lactic-co-glycolic acid) (PLGA), polyvinylidene chloride, acrylonitrile, amorphous nylon, oriented polyester, terephthalate, polyvinyl chloride, polyethylene, polypropylene, polystyrene, polyurethane, and alginate.

5. The benefit agent delivery system of claim 1, wherein the metallic material of the sealing layer is selected from the group consisting of metal particles, metal wires, metal fibers, metal flakes, metal rods, metal aggregates, and metal disks.

6. The benefit agent delivery system of claim 1, wherein the metallic material of the sealing layer comprises silver, copper, gold, platinum, zinc, chromium, nickel or combination thereof.

7. The benefit agent delivery system of claim 1, wherein the sealing layer further comprises a conductive material selected from the groups consisting of carbon black, carbon nanotubes, graphene, a dopant, and a conductive polymer.

8. The benefit agent delivery system of claim 1, wherein the carrier is selected from the group consisting of a liquid, a semi-solid, a gel and combinations thereof.

9. The benefit agent delivery system of claim 1, wherein the carrier is selected from a group comprising water, an organic compound, a silicone compound, and a combination thereof.

10. The benefit agent delivery system of claim 1, wherein the plurality of microcells comprises a benefit agent selected from the group consisting of a pharmaceutical agent, a vaccine, an antibody, a hormone, a protein, a nucleic acid, a nutraceutical agent, a nutrient, a cosmetic agent, a fragrance, a malodor removing agent, an agricultural agent, an air care agent, an anti-microbial agent, and a preservative.

11. The benefit agent delivery system of claim 1, wherein the sealing layer further comprises a benefit agent.

12. The benefit agent delivery system of claim 3, wherein the sealing layer and the electrode layer are integrated into one layer.

13. The benefit agent delivery system of claim 3, further comprising a porous diffusion layer or a rate control layer between the sealing layer and the electrode layer.

14. The benefit agent delivery system of claim 13, wherein the electrode layer and the porous diffusion layer are integrated into one layer.

15. The benefit agent delivery system of claim 3, further comprising an adhesive layer disposed between the sealing layer and the electrode layer.

16. The benefit agent delivery system of claim 15, further comprising a porous diffusion layer disposed between the adhesive layer and the electrode layer.

17. The benefit agent delivery system of claim 16, wherein the porous diffusion layer and the adhesive layer are integrated in one layer, and wherein the integrated layer has volume resistivity of less than 10^{-10} Ohm $*$ cm.