CLAIMS

1. An electrostatic end effector comprising:

a ceramic base comprising a plurality of pillars configured to support a substrate;

a first electrode layer disposed between the plurality of pillars on a surface of the ceramic base;

a dielectric layer disposed on the first electrode layer and on the plurality of pillars; and

a second electrode layer disposed on a portion of the dielectric layer on the plurality of pillars, wherein the electrostatic end effector is configured to generate an electrostatic force upon the substrate responsive to a voltage being applied to the first electrode.

2. The electrostatic end effector of claim 1, wherein the plurality of pillars are arranged in rows on a top surface of the ceramic base.

3. The electrostatic end effector of claim 2, further comprising a plurality of valleys between the rows of the plurality of pillars, wherein the first electrode layer is deposited on at least one or more surfaces of the plurality of valleys.

4. The electrostatic end effector of claim 2, wherein the first electrode layer and the second electrode layer comprise titanium layers deposited by a physical vapor deposition process.

5. The electrostatic end effector of claim 2, wherein:

the dielectric layer is deposited substantially on top of the first electrode layer and the plurality of pillars; and

the second electrode layer is deposited substantially on top of the dielectric layer.

6 The electrostatic end effector of claim 1, wherein the ceramic base comprises a plurality of laminated sheets, and wherein the ceramic base electrically insulates the first electrode layer from the second electrode layer.

7. The electrostatic end effector of claim 6, wherein the first electrode layer and the second electrode layer are embedded within the plurality of laminated sheets.

8. The electrostatic end effector of claim 6, wherein the plurality of pillars comprise a plurality of mesas distributed across a top surface of the ceramic base, wherein the plurality of mesas are configured to support the substrate.

9. The electrostatic end effector of claim 8, wherein the first electrode layer and the second electrode layer are platinum layers, the second electrode layer being substantially disposed beneath the first electrode layer, and the second electrode layer comprises one or more protrusions that rise through and protrude from one or more mesas of the plurality of mesas.

10. A method of manufacturing an electrostatic end effector, the method comprising:

providing a ceramic blank;

performing a material removal process on the ceramic blank to generate one or more features on a top surface of the ceramic blank;

depositing a cathode layer onto at least a top surface of the ceramic blank;

depositing a dielectric layer on top of at least the cathode layer; and

depositing an anode layer on top of at least a portion of the dielectric layer.

11. The method of claim 10, wherein the material removal process generates a plurality of pillars on the top surface of the ceramic blank, the plurality of pillars being configured to support a substrate positioned on the pillars.

12. The method of claim 10, wherein the material removal process generates a plurality of valleys on the top surface of the ceramic blank, wherein the cathode layer is deposited on one or more surfaces of the plurality of valleys.

13. The method of claim 10, wherein the cathode layer and the anode layer comprise titanium layers deposited by a physical vapor deposition process.

14. The method of claim 11, wherein:

the dielectric layer is deposited substantially on top of the first electrode layer and the plurality of pillars; and

the anode layer is deposited substantially on top of the dielectric layer on top of the plurality of pillars.

15. The method of claim 10 wherein at least one of the cathode layer, the dielectric layer, or the anode layer are deposited by a physical vapor deposition process.

16. A method of manufacturing an electrostatic end effector, the method comprising:

providing a plurality of ceramic sheets;

generating a set of laminated layers by performing a lamination process to combine a cathode layer and a ground layer with the plurality of ceramic sheets, wherein the ground layer is disposed beneath the cathode layer within the set of laminated layers;

generating a set of sintered layers by performing a sintering process to combine the set of laminated layers;

grinding at least a top surface of the sintered layers; and

polishing at least the top surface of the sintered layers.

17. The method of claim 16, further comprising

performing a material removal process to generate a plurality of mesas on the top surface of the electrostatic end effector.

18. The method of claim 16, wherein at least one of the cathode layer or the ground layer is comprised of platinum.

19. The method of claim 16, wherein the cathode layer and the ground layer reside on different planes in the sintered layers.

20. The method of claim 17, wherein the ground layer comprises one or more protrusions that rise through and protrude from one or more mesas.