[0006] Accordingly, a need exists for improved ESC manufacturing methods that resolve or mitigate some or all of the above described problems.

SUMMARY

[0007] In a first aspect, the present disclosure provides a method for manufacturing electrostatic chucks, comprising: depositing at least a first layer of a first dielectric material on a handle, which is formed from a ceramic material, using a depositing method selected from the group of depositing methods consisting of: spin coating, direct spray coating, or a combination thereof, wherein the first dielectric material is selected from the group of dielectric material consisting of yttrium, iridium, scandium, erbium, hafnium, silicon carbide, zirconium oxide, a lanthanoid, or a combination thereof; curing the at least the first layer of the first dielectric material at a temperature of at least 600 °C; depositing a functional electric layer on the at least the first layer of the first dielectric material; and depositing at least a second layer of a second dielectric material on the combination of the first layer of the first dielectric material and functional electric layer using a depositing method selected from the group of depositing methods consisting of: spin coating, direct spray coating, or a combination thereof; wherein the second dielectric material is selected from the group of dielectric material consisting of yttrium, iridium, scandium, erbium, hafnium, silicon carbide, zirconium oxide, a lanthanoid, or a combination thereof; curing the at least the second layer of the second dielectric material at a temperature of at least 600 °C; depositing a mechanical dielectric layer on the combination of the first layer of the first dielectric material, the functional electric layer, and the second layer of the second dielectric material, wherein the mechanical dielectric layer is formed from the same ceramic material as used for forming the handle; and patterning the mechanical dielectric layer. Additional optional steps, such as depositing a mechanical dielectric layer on the at least one layer of second dielectric material and patterning the mechanical dielectric layer, may also be carried out. In some embodiments, the material of the handle is Al_2O_3, AlN or Y_2O_3. In some embodiments, the first dielectric material and the second dielectric material are the same dielectric material, and the dielectric material is a material having a high dielectric constant. In some embodiments, the material of the mechanical dielectric layer is the same material as the handle.

[0007a] In a second aspect, the present disclosure provides an electrostatic chuck manufactured by the method according to the first aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figure 1 illustrates a configuration of an electrostatic chuck according to the prior art.

[0009] Figure 2 illustrates a tape casting technique according to the prior art.

[0010] Figure 3 is a flow diagram illustrating a method of manufacturing an electrostatic chuck according to various embodiments described herein.

[0011] Figure 4 illustrates an electrostatic chuck manufactured in accordance with methods described herein.

DETAILED DESCRIPTION

[0012] With reference to Figure 3, a method 300 for manufacturing an electrostatic chuck includes a step 310 of depositing at least one layer of first dielectric material on a handle using spin coating and/or direct spraying, a step 320 of depositing a functional electric layer on the at least one layer of a first dielectric material, and a step 330 of

CLAIMS

I/We claim:

1. A method of manufacturing an electrostatic chuck, comprising:

depositing at least a first layer of a first dielectric material on a handle, which is formed from a ceramic material, using a depositing method selected from the group of depositing methods consisting of: spin coating, direct spray coating, or a combination thereof, wherein the first dielectric material is selected from the group of dielectric material consisting of yttrium, iridium, scandium, erbium, hafnium, silicon carbide, zirconium oxide, a lanthanoid, or a combination thereof;

curing the at least the first layer of the first dielectric material at a temperature of at least 600 °C;

depositing a functional electric layer on the at least the first layer of the first dielectric material; and

depositing at least a second layer of a second dielectric material on the combination of the first layer of the first dielectric material and the functional electric layer using a depositing method selected from the group of depositing methods consisting of: spin coating, direct spray coating, or a combination thereof; wherein the second dielectric material is selected from the group of dielectric material consisting of yttrium, iridium, scandium, erbium, hafnium, silicon carbide, zirconium oxide, a lanthanoid, or a combination thereof;

curing the at least the second layer of the second dielectric material at a temperature of at least 600 °C;

depositing a mechanical dielectric layer on the combination of the first layer of the first dielectric material, the functional electric layer, and the second layer of the second

dielectric material, wherein the mechanical dielectric layer is formed from the same ceramic material as used for forming the handle; and

patterning the mechanical dielectric layer.

2. The method of claim 1, wherein the first dielectric material is identical to the second dielectric material.

3. The method of claim 2, wherein the first dielectric material and the second dielectric material are a high dielectric constant material.

4. The method of claim 1, wherein the first dielectric material and the second dielectric material both have a dielectric constant greater than 3.

5. The method of claim 1, wherein depositing at least the first layer of the first dielectric material comprises spin coating and wherein the spin coating comprises:

applying a small amount of a liquid dielectric material on the handle; and

rotating the handle at a velocity to spread the liquid dielectric material by centrifugal force.

6. The method of claim 1, wherein depositing at least the first layer of the first dielectric material comprises direct spray coating

7. The method of claim 1, further comprising curing the deposited the first layer of the first dielectric material at least prior to depositing a subsequent layer of dielectric material.

~~8. The method of claim 7, wherein curing comprises heating the first layer of the first dielectric material to at least 600 °C.~~

~~9~~8. The method of claim 1, wherein depositing at least the first layer of the first dielectric material comprises depositing a plurality of layers of the first dielectric material.

~~10~~9. The method of claim ~~9~~8, wherein depositing the plurality of layers of the first dielectric material all use spin coating.

~~11~~10. The method of claim ~~9~~8, wherein depositing the plurality of layers of the first dielectric material all use direct spray coating.

~~12~~11. The method of claim ~~9~~8, wherein depositing the plurality of layers of the first dielectric material has at least one of the plurality of layers deposited using spin coating at least one of the plurality of layers deposited using direct spray coating.

~~13~~12. The method of claim 1, wherein depositing at least the second layer of the second dielectric material comprises depositing a plurality of layers of the second dielectric material.

~~14~~13. The method of claim ~~13~~12, wherein depositing the plurality of layers of the second dielectric material all use spin coating.

~~15~~14. The method of claim ~~13~~12, wherein depositing the plurality of layers of the second dielectric material all use direct spray coating.

~~16~~15. The method of claim ~~13~~12, wherein depositing the plurality of layers of the second dielectric material has at least one of the plurality of layers deposited using spin coating at least one of the plurality of layers deposited using direct spray coating.

~~17. The method of claim 1, further comprising:~~

~~depositing a mechanical dielectric layer on a final layer of the second dielectric material; and~~

~~patterning the mechanical dielectric layer.~~

~~18. The method of claim 1, wherein the first dielectric material and the second dielectric material include at least one of an oxide, a metal oxide, a nitride, a boride, a carbide, a fluoride.~~

~~19. The method of claim 1 wherein the first dielectric material and the second dielectric material include at least one of yttrium, iridium, scandium, erbium, hafnium, silicon carbide, zirconium oxide, or a lanthanoid.~~

~~20~~16. An electrostatic chuck manufactured by the method recited in claim 1.