assemblies with a much higher level of waterproofing than is currently available. In addition, the inventors have tuned the plasma chemistry and engineered the material structure so that such coatings are hard and have excellent scratch resistance.

According to a first aspect of the present invention, there is provided an electrical assembly which has a multi-layer conformal coating on at least one surface of the electrical assembly, wherein: each layer of the multi-layer coating is obtainable by plasma deposition of a precursor mixture comprising one or more organosilicon compounds; and the lowest layer of the multilayer conformal coating, which is in contact with the surface of the electrical assembly, is organic and is obtainable by plasma deposition of a said precursor mixture containing no, or substantially no, O2, N2O or NO2; and the uppermost layer of the multi-layer conformal coating is organic and is obtainable by plasma deposition of a said precursor mixture containing no, or substantially no, O_2, N_2O or NO_2.

According to a second aspect of the present invention, there is provided an electrical component which has a multi-layer conformal coating as defined in the first aspect on at least one surface of the electrical component.

Brief Description of the Figures

Figure 1 shows an example of an electrical assembly of the invention which has a multi-layer conformal coating.

Figures 2 to 4 show cross sections through the multi-layer conformal coating in Figure 1, and depict the structures of preferred coatings.

Figure 5 shows the Fourier transform infrared (FTIR) spectrum for the coating prepared in Example 1.

Figure 6 shows the FTIR spectrum for the coating prepared in Example 2.

Figure 7 shows the results from Example 4, in which combs were coated with various multi-layer conformal coatings and then tested for electrical resistance when coated with water.

Detailed Description of the Invention

The multi-layer conformal coatings of the invention comprise layers which are obtainable by plasma deposition of organosilicon compounds. The organosilicon compound(s) can be deposited in the presence or absence of reactive gases and/or non-reactive gases. The resulting layers deposited have general formula $SiO_xH_yC_zF_aN_b$, wherein the values of x, y, z, a and b

CLAIMS

1. An electrical assembly which has a multi-layer conformal coating on at least one surface of the electrical assembly, wherein:

each layer of the multi-layer coating is obtainable by plasma deposition of a precursor mixture comprising one or more organosilicon compounds; and

the lowest layer of the multilayer conformal coating, which is in contact with the surface of the electrical assembly, is organic and is obtainable by plasma deposition of a said precursor mixture containing no, or substantially no, O_2, N_2O or NO_2; and

the uppermost layer of the multi-layer conformal coating is organic and is obtainable by plasma deposition of a said precursor mixture containing no, or substantially no, O_2, N_2O or NO_2.

2. The electrical assembly according to claim 1, wherein the multi-layer conformal coating has two to ten layers.

3. The electrical assembly according to claim 2, wherein the multi-layer conformal coating has four to eight layers.

4. The electrical assembly according to any one of claims 1 to 3, wherein the plasma deposition is plasma enhanced chemical vapour deposition (PECVD).

5. The electrical assembly according to any one of the preceding claims, wherein the plasma deposition occurs at a pressure of 0.001 to 10 mbar.

6. The electrical assembly according to any one of the preceding claims, wherein the lowest layer of the multi-layer conformal coating is obtainable by plasma deposition of a precursor mixture containing no, or substantially no, O_2, N_2O, NO_2, fluorine-containing organosilicon compound, SiF_4 or HFP.

7. The electrical assembly according to any one of the preceding claims, wherein the uppermost layer of the multi-layer conformal coating is obtainable by plasma deposition of a precursor mixture comprising one or more halogen-containing organosilicon compounds, SiF_4 and/or HFP.

8. The electrical assembly according to any one of the preceding claims, wherein the final/uppermost layer of the multi-layer conformal coating is obtainable by plasma deposition of a precursor mixture comprising He, Ar and/or Kr.

9. The electrical assembly according to any one of the preceding claims, wherein at least one layer of the multi-layer conformal coating is a moisture barrier layer obtainable by plasma deposition of a precursor mixture comprising O_2, N_2O and/or NO_2

10. The electrical assembly according to any one of the preceding claims, wherein at least one layer of the multi-layer conformal coating is a moisture barrier layer obtainable by plasma deposition of a precursor mixture comprising a nitrogen-containing organosilicon compound, N_2, NO_2, N_2O and/or NH_3.

11. The electrical assembly according to claim 9 or 10, wherein the precursor mixture from which the at least one moisture barrier layer is obtainable further comprises He, Ar and/or Kr.

12. The electrical assembly according to any one of claims 9 to 11, wherein the at least one moisture barrier is located between the first/lowest layer and the final/uppermost layer of the multi-layer coating.

13. The electrical assembly according to any one of the preceding claims, wherein the one or more organosilicon compounds from which each layer of the multi-layer coating is obtainable by plasma deposition is independently selected from hexamethyldisiloxane (HMDSO), tetramethyldisiloxane (TMDSO), 1,3-divinyltetramethyldisiloxane (DVTMDSO), hexavinyldisiloxane (HVDSO allyltrimethylsilane, allyltrimethoxysilane (ATMOS), tetraethylorthosilicate (TEOS), trimethylsilane (TMS), triisopropylsilane (TiPS), trivinyl-trimethyl-cyclotrisiloxane (V_3D_3), tetravinyl-tetramethyl-cyclotetrasiloxane (V_4D_4), tetramethylcyclotetrasiloxane (TMCS), octamethylcyclotetrasiloxane (OMCTS), hexamethyldisilazane (HMDSN), 2,4,6-trimethyl-2,4,6-trivinylcyclotrisilazane, dimethylamino-trimethylsilane (DMATMS), bis(dimethylamino)dimethylsilane, (BDMADMS), tris(dimethylamino)methylsilane (TDMAMS), trimethyl(trifluoromethyl)silane or 1H,1H,2H,2H-perfluorooctyltriethoxysilane and 3-(Diethylamino)propyl-trimethoxysilane.

14. The electrical assembly according to any one of the preceding claims, which electrical assembly comprises a substrate comprising an insulating material, a plurality of conductive tracks present on least one surface of the substrate, and at least one electrical component connected to at least one conductive track.

15. The electrical assembly according to claim 14, wherein the multi-layer conformal coating covers the plurality of conductive tracks, the at least one electrical component and the surface of the substrate on which the plurality of conductive tracks and the at least one electrical component are located.

16. An electrical component which has a multi-layer conformal coating as defined in any one of claims 1 to 13 on at least one surface of the electrical component.

17. The electrical component according to claim 16, which is a resistor, capacitor, transistor, diode, amplifier, relay, transformer, battery, fuse, integrated circuit, switch, LED, LED display, Piezo element, optoelectronic component, antenna or oscillator.