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(54) Depositing porous films by evaporating material on to a surface

(57) The material, e.g. gold, is evaporated onto the surface through a mesh. The film may be at least one of the water vapour porous electrodes provided on opposite faces of a slab of hygroscopic dielectric material to form a capacitor humidity sensor.

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SPECIFICATION

Method of depositing porous films

This invention relates to methods of depositing porous films.

In order for a deposited film of material to be porous it is necessary for the film to be thin. At the same time, the film will normally be required to be of sufficient thickness to constitute a substantially continuous film, for example, so as to provide an equipotential surface where, as is frequently the case, the film consists of electrically conductive material and constitutes an electrode of a device e.g a capacitor.

It is an object of the present invention to provide a method of depositing a porous film which facilitates the meeting of these two conflicting requirements.

According to the present invention a method of depositing a porous film of material onto a surface comprises evaporating the material onto the surface through a mesh.

The method has the advantage that a high degree of control may be exerted since the porosity can be controlled not only by controlling the quantity of deposited material, but also by choice of the mesh size and distance between the mesh and the surface.

One particular application of the invention is in the construction of humidity sensors of the kind comprising a capacitor comprising a slab of hygroscopic dielectric material provided with electrodes on its opposite faces at least one of which is porous to water vapour.

In such a device the porous electrode suitably consists of gold because of its chemical stability.

One method in accordance with the invention will now be described by way of example.

The method is used to form a porous gold electrode of a capacitor humidity sensor of the kind mentioned above.

The deposition is carried out in a conventional vacuum evaporator of the kind used widely in the manufacture of semi conductor and thin film circuits.

The gold to be deposited is placed in the furnace in a boat and the surface on which the gold is to be deposited is disposed horizontally, face down, about 12 centimetres above the boat. The surface will normally be masked to restrict deposition to selected areas of the surface by a reticle plate or by a mask provided on the surface by known photolithographic techniques.

Between the boat and the surface, spaced 2 millimetres from the surface, there is disposed a stainless steel wire mesh of size 125 meshes to the centimetre, the mesh being held in a suitable frame.

Deposition of the film is effected by vapourising the gold by boiling, deposition of a satisfactory electrically conductive film, porous to water vapour, typically taking about half a minute.

The deposited film is found to be of smoothly varying thickness with the maximum thickness at points corresponding to the centres of the holes in the mesh and minimum thickness along lines corresponding to the centres of the wires of the mesh. The porosity of the film is ensured by the thinner areas, but at the same time the thinner areas are of restricted area and connected by relatively thick areas so that the film exhibits overall good electrical conductivity.

It will be appreciated that the porosity and electrical conductivity of the film may be controlled by choice of the mesh size and spacing of the mesh from the surface. Thus, in general, the difference in thickness of the thinner and thicker areas may be increased by reducing the spacing or increasing the mesh size. However for the best results a mesh of size not less than 50 meshes to the centimetre is used and the spacing between the mesh and the surface is not more than 3 millimetres. It will be understood that the choice of a suitable size for the area of the source of material to be deposited will depend on the area of the surface on which material is to be deposited. However, it is pointed out that in general the source should have a sufficiently large area to avoid parts of the surface on which material is to be deposited being totally screened from the source by the wires of the mesh so that virtually no material is deposited on such parts.

CLAIMS

1. A method of depositing a porous film of material onto a surface comprising evaporating the material onto the surface through a mesh.

2. A method according to Claim 1 wherein said surface is disposed substantially horizontally, face down, above a source of said material, said mesh being positioned between the surface and the source substantially parallel to and adjacent said surface.

3. A method according to Claim 1 or Claim 2 wherein said material is an electrically conductive material.

4. A method according to Claim 3 wherein said material is gold.

5. A method according to any one of the preceding claims wherein said mesh is a metal mesh.

6. A method according to Claim 5 wherein said mesh is a stainless steel mesh.

7. A method according to any preceding claim wherein the mesh has not less than 50 meshes to the centimetre.

8. A method according to any preceding claim wherein the mesh is spaced from the surface by a distance not greater than 3 millimetres.

9. A method of depositing a porous film onto a surface substantially as hereinbefore described by way of example.

10. A porous film produced by a method according to any one of the preceding claims.

11. A humidity sensor comprising a slab of hygroscopic dielectric material provided with electrodes on its opposite faces at least one of which comprises a porous film of material deposited by a method according to any one of Claims 1 to 9.

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