Socket Coating

Field of the Invention

[0001] The present invention relates to integrated circuit (IC) testing. In particular, the invention relates to a polymer coating of engineering plastic components for automated IC testing and a method of providing the same.

Background

[0002] In high precision automation, the components used in the processes, such test sockets, nests, lead-backers and etc, are required to be made and maintained in precise dimensions. Such automation processes generally have very low tolerance in error/change in dimensions of the components.

[0003] For some automated IC testing, for example, the components are made in engineering plastics. Common low cost engineering plastics used for making the components absorb moisture from the ambient air and change in size over time. Variance in dimensions of the components may cause test failures or damage the parts to be tested.

[0004] When the drift in dimensions of the components occurs, a straightforward solution is to replace the defective components and scrapped the defective components. However, as the replacement components are made up of the same engineering plastics, the replacement components may already have changed in

its dimension due to the moisture absorption. Alternatively, the defective components can be reconditioned to restore its dimensions to the required specification.

[0005] The above-mentioned engineering plastics are known to absorb moisture. However, variance in dimension of components is often not obvious in IC testing as change in dimension of components only occurs after a period or time. Therefore, such problem is not reported.

[0006] To reduce the change in dimension for components made in the engineering plastics, the components have to be stored in a controlled environment with low level of moisture. Alternatively, the components of concerns can be made by other engineering plastic that have a low permeability to moisture. However, such higher-grade engineering plastics are generally costly.

[0007] Pre-baking the engineering plastics before any machining is also possible to remove moisture. The pre-baking process requires a baking oven with temperature control and it must be handled with care. However such method requires additional process in the machining, and it can be time consuming and costly.

[0008] Further, during a cleaning process for the components involving wet works or corrosive chemical, corrosion to the components may occur.

Summary

[0009] In accordance with one aspect, the present invention is a method for providing a barrier to components for IC testing, the method comprising providing a component in a deposition unit; loading a dimer in a vaporizer; vaporizing the dimer; pyrolyzing the vaporized dimer; and depositing monomer to form a coating as the barrier on the component; controlling the timing of the deposition, wherein the coating has a low permeability to moisture and gasses to prevent moisture or gas absorption

[0010] In accordance with one embodiment, the component is made up of a material having high permeability to moisture and gasses. It is possible that the coating is polymer or Parylene.

[0011] In accordance with another embodiment, the component is made with plastic with high permeability to moisture and gasses.

[0012] In accordance with yet another embodiment, the timing of the deposition is controlled to form the coating with thickness of 0.01mm to 0.15mm.

[0013] In accordance with another aspect of the present invention, there is provided a socket for IC testing, the socket comprising a layer of coating, wherein the coating has a low permeability to moisture and gasses to prevent moisture or gas absorption.

[0014] In accordance with one embodiment, the socket may be made with plastic with high permeability to moisture and gasses. In accordance with one embodiment, the coating may be polymer or Parylene.

Brief Description of the Drawings

[0015] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0016] FIG.1 exemplifies a component in accordance with an embodiment of the present invention;

[0017] FIG.2 illustrates a schematic diagram of a deposition system in accordance with one embodiment of the present invention; and

[0018] FIG. 3 illustrates a flow diagram of a deposition process in accordance with one embodiment of the present invention.

Detailed Description

[0019] In line with the above summary, the following description of a number of specific and alternative embodiments are provided to understand the inventive features of the present invention. It shall be apparent to one skilled in the art, however that this invention may be practiced without such specific details. Some of the details may not be described at length so as not to obscure the invention. For ease of reference, common reference numerals will be used throughout the figures when referring to the same or similar features common to the figures.

[0020] FIG. 1 exemplifies a non-limiting example of a component **100** in accordance with one embodiment of the present invention. The component is a nest. There are critical dimensions on the component **100** for which, these dimensions have low tolerance on any errors/changes. These critical dimensions are marked in the figure referenced as A, B, C, D, and E respectively. The component **100** is made up of engineering plastic, such as Torlon® 4203, Torlon® 5030, Torlon® 5530, Vespel® SP-1, Vespel® SP-211, and the like. These materials have a high permeability to moisture and corrosive gas and they are relatively low cost when comparing with competing materials suitable for high quantity production under normal condition. These engineering plastics, absorb moisture from ambient and cause at least the dimensions A-E of the component **100** to change. In precision testing in high speed, change in dimesion of the component **100** may cause test failures or damage the parts to be tested. In view of that, the component **100** is pre-coated with a layer of barrier **101** to protect the component **100** from permeabilized by moisture and corrosive chemical of any form that cause the change in dimensions of the component **100**. The barrier **101** is

made up of a pinhole-free engineering polymer that has low permeability to moisture and corrosion gas.

[0021] In the above embodiment, engineering polymer having low permeability to moisture and corrosion gas is provided. It is understood to the skilled person that any other coating material can be used as long the it has a low permeability to moisture and corrosion gas.

[0022] FIG. 2 illustrates a schematic diagram of a deposition system **200** for depositing polymer in accordance with one embodiment of the present invention. The deposition system **200** comprises a vaporizer **210**, a pyrolysis unit **220**, a deposition unit **230**, a trap **240**, and a vacuum pump **250**. The polymer deposition is performed in a vacuum environment created by the vacuum pump **250**. The trap **240** installed between the deposition unit **250** and the vacuum pump **240** provides adequate purging of precursors from the system while creating the vacuum environment. A dimer of polymer is loaded into the vaporizer **200**. The dimmer is then converted to a reactive vapor in the vaporizer **210** and sent to the pyrolysis unit **220** to cleave the dimer into monomer vapor. The monomer vapor is then passed to the deposition unit **220** for coating on the object loaded therein. The deposition process is performed in a vacuum environment created by the vacuum pump **250**.

[0023] FIG. 3 shows a flow diagram of a polymer deposition process in accordance with one embodiment of the present invention. The process will be described in conjunction with FIG. 2. In step **310**, the component **100** is loaded in the deposition unit **230**. In step **320**, a dimer of suitable coating material is loaded in the

vaporizer **210**. The suitable coating material includes any coating material that has a low permeability to moisture and corrosive gasses, such as parylene as described above. In step **330**, a vaporization process is performed for vaporizing the dimer at approximately **150°**C, 1 Torr (or 1 mmHg) at the vaporizer **210**. In step **340**, a purolysis process (quantitative cleavage) is performed for pyrolyzing the dimer vapor at approximately **680°**C, 0.5 Torr (or 0.5 mmHg) to form the monomer. The monomeric vapor enters deposition unit **230**, which is maintained in room temperature, and in step **350**, the vapor is spontaneously polymerized and deposited on the components **100**. In this step **350**, the thickness of the coating can be controlled within the deposition unit **230** by controlling the timing of deposition process. The deposition process step **330-350** is performed at a vacuum environment.

[0024] Depending on requirements, coating thickness for the barrier coating is controlled from 0.01mm to 0.15mm. For example, when the purpose of the coating is mainly for controlling moisture absorption that causes engineering plastic to grow, a 0.01mm±30% thick of coating is sufficient. When component coated with the coating is to be re-conditioned, the coating thickness will depend on the requirement needed for the re-conditioning.

[0025] Coating of the barrier **101** further serves as an insulator coat to prevent short circuit when the electronic components are placed very close to each other.

[0026] Further, the barrier **101** is also an insulator for protecting the components from corrosion caused during cleaning process that involves wet works or corrosive chemical.

[0027] With the above deposition process, unlike vacuum metallizing, all sides of component **100** are uniformly impinged with gaseous monomer and produced a conformal coating.

[0028] For the purpose of the present invention, polymer is used as a coating for the barrier **101**. One non-limiting example of the polymer for the barrier **101** is Parylene. Parylene is a generic name for members of a unique polymer series. The basic member of the polymer series is Parylene-N that is a completely linear and highly crystalline material. Parylene-C is a commercially available Parylene that is produced from the Parylene-N dimer modified by a substitution of chlorine atom for one of the aromatic hydrogen. Parylene-C has a useful combination of electrical and physical properties plus a very low permeability to moisture and corrosive gas.

[0029] The Parylene can be coated with the deposition system **200** and method as described in FIGs. 2 and 3. A dimer, in a form of powder is added to the system **200** and heated to 150°C, 1 Torr to change the dimer to vapor at the vaporizer **210**. The dimer molecule is further heated to around 680°C, 0.5 Torr to change the vapor molecule to monomer at the pyrolysis unit **220**. In the deposition unit **230**, the monomer is coated at room temperature in a form of transparent polymer film. The polymer film is a conformal layer and pinhole-free film coated on the subject substrate.

[0030] The example in FIG. 1 shows a nest as the component **100**. It is understood for the skilled person that any component such as lead backers, work press blades, test socket housing, socket alignment plates, socket floating plates and etc. may be made in accordance with the present invention.

[0031] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations and combinations thereof could be made to the present invention without departing from the scope of the invention.

Claims

1. A method for providing components with a barrier for IC testing, the method comprising:

providing a component in a deposition unit;

loading a dimer in a vaporizer;

vaporizing the dimer;

pyrolyzing the vaporized dimer;

depositing monomer to form a coating as the barrier on the component;

controlling timing of the deposition;

wherein the coating has a low permeability to moisture and gasses to prevent moisture or gas absorption

2. The method according to claim 1, wherein the component is made up of a material having high permeability to moisture and gasses.

3. The method according to claim 1 or 2, wherein the coating is polymer.

4. The method according to claim 1 or 2, wherein the coating is Parylene

5. The method according to any one of the preceding claims, wherein the component is made with plastic with high permeability to moisture and gasses.

6. The method according to any one of the preceding claims, wherein the timing of the deposition is controlled to form the coating with thickness of 0.01mm to 0.15mm.

7. A socket for IC testing, the socket comprising a layer of coating, wherein the coating has a low permeability to moisture and gasses to prevent moisture or gas absorption.

8. The socket according to claim 7, wherein the socket is made with plastic with high permeability to moisture and gasses.

9. The socket according to claim 7 or 8, wherein the coating is polymer.

10. The socket according to any one of claims 7-9, wherein the coating is parylene.

11. The socket according to any one of claims 7-10, wherein the coating has a thickness of 0.01mm to 0.15mm.

12. The socket according to any one of claims 7-11, manufactured based on the method according to any one of claims 1-6.