

increasingly smaller. Many of the conventional coatings are brittle, making them unsuitable for flexible structures. A further problem with many traditional coatings occurs when devices are subjected to repeated thermal cycling when the coating can become detached from the device due to limited adhesion and differences in the expansion characteristics. With many of the conventional coatings it is not possible to solder through them, making it necessary to remove the coating before repairs or upgrades can be carried out.

Parylene coatings have been developed to offer a partial solution to the limitations (eg US6389690). These coatings are applied under vacuum and are therefore well suited to applying to complex three-dimensional structures. The production process is complex because solid precursors are used that have to be sublimated to start with and then a high temperature pyrolysis must be carried out before a useful monomer in the gas phase is formed. Parylene coatings are thinner than traditional conformal coatings, typically less than 1 to tens of micrometers. Different pretreatments remain necessary for proper adhesion of the coating to all the components of a three-dimensional structure including assemblies or sub assemblies, and to ensure that this adhesion is maintained during the lifetime of the product. Like most traditional conformal coatings, parylene coatings must be removed before repairs are carried out. It is not easy to remove such parylene coatings.

SUMMARY

In one aspect, there is provided a method for depositing a conformal nanocoating on all surfaces and all parts of a three-dimensional structure or assembly composed of electrically conductive and electrically non-conductive elements, characterized in that said coating is deposited by a low pressure plasma polymerisation process preceded by a degassing step of the structure or assembly.

In another aspect, there is provided the use of the method as defined herein for coating electronic components, electronic devices, bare printed circuit boards and assemblies thereof.

In another aspect, there is provided the use of the method as defined herein for depositing a nanocoating to provide a waterrepellent and/or oil repellent protection to all surfaces and parts of the three-dimensional structure or assembly.

In another aspect, there is provided a three-dimensional structure or assembly comprising a conformal nanocoating deposited by a method as defined herein on all surfaces and parts of the structure or assembly.

DETAILED DESCRIPTION

The present invention uses plasma polymerization which is a process where a thin polymeric film is deposited on any surface that comes in contact with the plasma of an organic monomer, which has been created in the chamber. Depending on the deposition conditions, also called the plasma parameters, such as power, pressure, temperature, flow, etc, the properties of the film may be adapted to the requirements of the applications of the devices.

CLAIMS

1. Method for depositing a conformal nanocoating on all surfaces and all parts of a three-dimensional structure or assembly composed of electrically conductive and electrically non-conductive elements, characterized in that said coating is deposited by a low pressure plasma polymerisation process preceded by a degassing step of the structure or assembly.
2. Method according to claim 1 whereby the degassing and the plasma polymerisation process are processed in the same plasma chamber.
3. Method according to claims 1 to 2, whereby the coating has a thickness between 25 and 250nm, preferably of approximately 80 nm.
4. Method according to claims 1 to 2, whereby the plasma process is performed at pressures between 1.33 Pa and 133.32 Pa, preferably at 6.67 Pa.
5. Method according to claims 1 to 2, whereby the plasma process is performed at a temperature between 20 to 90°C.
6. Method according to claims 1 to 2, whereby the plasma process is performed at a frequency of 20 kHz to 2.45 GHz, preferably 40 kHz, more preferably 13.56 MHz.
7. Method according to any of claims 1 to 6, whereby the RF power is continuously maintained during the plasma polymerisation process.
8. Method according to any of claims 1 to 6, whereby the RF power is pulsed during the plasma polymerisation process, and the frequency of the pulses is typically between 1 Hz and 100 kHz, with a mark to space ratio typically between 0.05 and 50%.