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Features epoxy-rubber adhesive layer on the dielectric surface

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Abstract

Photo-selective and non-palladium activations of dielectric materials are widely used in the production technology of printed circuit boards by additive method. To obtain a given diagram drawing on the surface and in the holes of the printed circuit Board, it is necessary to form catalytic active centers for further chemical metallization. The most important stage of these technological processes is the preparation of the surface of dielectric materials, providing high importance of adhesion of metal to the dielectric base. As delectrics are usually used fiberglass with epoxy adhesive layer.

Chemical modification of the dielectric base surface includes the stages of swelling and etching of the adhesive layer. As object of research was chosen as the dielectrics of the brand STACK and STEHO materials based on glass fibre laminate, which apoximately pressed onto the adhesive layer. The thickness of the adhesive layer were 25-100 μm.

The surface of the dielectric must have a hydrophilicity and roughness before activation to ensure uniform distribution of the activator on the surface, fixing the required amount of activator on the surface and sufficiently high adhesion of the metal coating to the dielectric base. The adhesive layer of insulators of the STEC and STEO brands represents two-phase system which is intended to provide roughness of a surface due to different speeds of etching of an epoxy and rubber phase.

The surface micro-roughness is formed at the stage of swelling in organic solvents and at the stage of etching of the adhesive layer in chromic acid solutions. It is found that the formation of the surface layer is more influenced by the stage of swelling of the adhesive layer than the stage of etching. The process of swelling of the epoxy-rubber adhesive layer in dimethylformamide and dimethylsulfoxide is studied. It was found that the rate of swelling in dimethylformamide is twice higher than in dimethyl sulfoxide.

The change of surface roughness for dimethylformamide and dimethylsulfoxide in the change of etching time is the same. At change of time of etching in chromic acid solutions the surface roughness changes within 0.60-0.76 microns.

Kinetics of etching process of the epoxy-rubber adhesive layer is studied. The optimal modes of etching of the epoxy-rubber adhesive layer are determined. Microphotographs of the surface of the samples provide an idea of the configuration and size of etched areas, reflect the structure of the adhesive layer and confirm the position of the different etching rate of epoxy and rubber components, as evidenced by the alternation of depressions, caverns and small relief elements. An increase in the swelling time in organic solvents over 3 minutes leads to an increase in the mass of the bleed adhesive layer up to full bleed on individual sites.

Kinetics of etching process of the epoxy-rubber adhesive layer is studied. The curves of the etching was removed by the gravimetric method by the mass loss of the sample. The optimal modes of etching of the epoxy-rubber adhesive layer are determined. It was found that the increase in the effective adhesion surface (S_{SC}) of the adhesive layer leads to an increase in the adhesion of the metal coating to the dielectric.

The mode of etching in chromic acid solutions should be such that the coefficient of adhesion of$k_{сц}$ = 2 and the depth of craters formed during etching is half the diameter of the crater ($h \approx D/2$).

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