

METHOD OF FORMING A POLYMER ON A SUBSTRATE

The U.S. Government has rights in this invention under U.S. Air Force Contract F33615-89-C-5603

PRIOR ART

This invention relates to materials used to provide isolation of conductive layers in microelectronic circuitry. In particular, it relates to polymeric materials which can be photopolymerized so that dielectric layers can be formed where desired in multilayer structures. Such layers must be excellent insulators, have good chemical resistance and, of course, must adhere to the substrate on which they are placed.

Polyimides have been used for such dielectrics since they have superior temperature and chemical resistance compared to many other polymers. Literature and patents disclosing the use of polyimides are extensively discussed in U.S. Pat. No. 4,908,096 by one of the present inventors and incorporated herein by reference. The disadvantages of the polyimides are discussed, namely, that they release large amounts of volatiles during curing, absorb moisture, have poor adhesion, and have a relatively high coefficient of expansion. The patent discloses and claims the use of other polymers as interlevel dielectrics having improved properties, namely, vinyl benzyl or alkyl ethers of the condensation products of dialdehydes and phenols.

The present invention relates to other polymers which have been found to provide useful interlevel dielectrics.

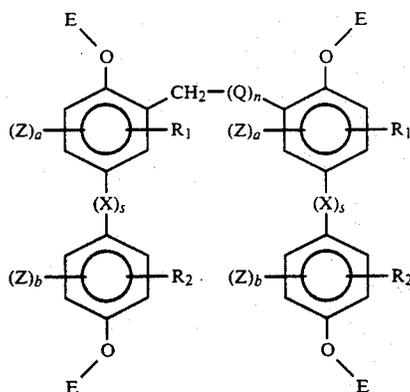
In U.S. Pat. No. 4,855,375 one of the present inventors has disclosed oligomers which are ethers of bisphenols and formaldehyde which may be fluorinated and which have application to making laminated boards for electronic applications. The patent is incorporated by reference herein. Such fluorinated polymers have been found to be useful as interlevel dielectrics, as will be seen in the discussion below.

SUMMARY OF THE INVENTION

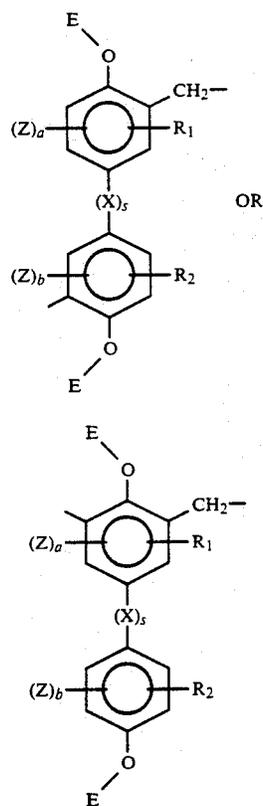
This invention comprises a method of forming a predetermined pattern from a polymer on a substrate and the thus-created dielectric layers which may be used in an electronic interconnect structure.

Such patterns are created by coating onto the substrate a prepolymer and then irradiating the exposed portions of a masking pattern to render the prepolymer insoluble, then selectively dissolving the non-irradiated masked portions of the coating leaving the insoluble irradiated prepolymer, and curing the irradiated prepolymer to form an infusible glassy solid in the predetermined pattern.

The prepolymer is an ether of the oligomeric condensation product of a dihydric phenol and formaldehyde having the formula



where the recurring unit Q has the structure,



and

n is an integer from 1 to 10;

s is 1;

each X is $C(CF_3)_2$;

each R_1 and R_2 is independently selected from the group consisting of hydrogen, alkyl and alkoxy moieties containing 1 to 10 carbon atoms, phenyl and phenoxy;

a and b are independently 0 or integers from 1 to 4; Z is Cl or Br;

E is selected from the group consisting of the vinylbenzyl moiety, alkyl moieties containing 1 to 10 carbon atoms, or benzyl, subject to the constraint that at least 50% of all E's are the vinylbenzyl moiety.