METHOD FOR FORMING A POROUS DIELECTRIC MATERIAL LAYER IN A SEMICONDUCTOR DEVICE AND DEVICE FORMED

ABSTRACT OF THE DISCLOSURE

A method for forming a porous dielectric material layer (14) in an electronic structure (70) and the structure (70) formed are disclosed. In the method, a porous dielectric layer (14) in a semiconductor device (70) can be formed by first forming (10) a non-porous dielectric layer (14), then partially curing (20), patterning (30) by reactive ion etching, and final curing (40) the non-porous dielectric layer (14) at a higher temperature than the partial curing (20) temperature to transform the non-porous dielectric material (14) into a porous dielectric material (14), thus achieving a dielectric material that has significantly improved dielectric constant, i.e. smaller than 2.6. The non-porous dielectric material (14) may be formed by embedding a thermally stable dielectric material such as methyl silsesquioxane, hydrogen silsesquioxane, benzocyclobutene or aromatic thermoset polymers with a second phase polymeric material therein such that, at the higher curing temperature, the second phase polymeric material substantially volatilizes to leave voids behind forming a void-filled dielectric material.

Fig. 1