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Preparation and properties of mesoporous silica/bismaleimide/diallylbisphenol composites with improved thermal stability, mechanical and dielectric properties

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Abstract. New composites with improved thermal stability, mechanical and dielectric properties were developed, which consist of 2,2′-diallylbisphenol A (DBA)/4,4′-bismaleimidodiphenylmethane (BDM) resin and a new kind of organic/inorganic mesoporous silica (MPSA). Typical properties (curing behavior and mechanism, thermal stability, mechanical and dielectric properties) of the composites were systematically investigated, and their origins were discussed. Results show that MPSA/DBA/BDM composites have similar curing temperature as DBA/BDM resin does; however, they have different curing mechanisms, and thus different crosslinked networks. The content of MPSA has close relation with the integrated performance of cured composites. Compared with cured DBA/BDM resin, composites with suitable content of MPSA show obviously improved flexural strength and modulus as well as impact strength; in addition, all composites not only have lower dielectric constant and similar frequency dependence, more interestingly, they also exhibit better stability of frequency on dielectric loss. For thermal stability, the addition of MPSA to DBA/BDM resin significantly decreases the coefficient of thermal expansion, and improves the char yield at high temperature with a slightly reduced glass transition temperature. All these differences in macro-properties are attributed to the different crosslinked networks between MPSA/DBA/BDM composites and DBA/BDM resin.

Keywords: *thermosetting resins, bismaleimide, meosoporous silica, dielectric properties, structure-property*

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