INFLUENCE OF POROGEN ON THERMAL STABILITY OF NOVEL NANOPOROUS CYANATE ESTER RESIN FILMS

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High crosslink density Cyanate Ester Resins (CERs), which are known as polycyanurates, are commonly used in aerospace applications and electronic devices as high temperature polymer matrices, adhesives etc. CERs have unique combination of intrinsic properties, including thermal, fire, radiation and chemical resistance, high tensile moduli (3.1–3.4 GPa) and glass transition temperatures (T_g > 220 °C), low dielectric constants (ε ~ 2.6–3.2), high adhesion to conductor metals and composites as well as low water/moisture uptake.

Ionic liquids (ILs) are organic salts that typically consist of bulky, asymmetric organic cations and inorganic symmetric anions. The interest in ILs arises from their specific properties, including negligible vapour pressure, wide liquid-state temperature range, excellent thermal and chemical stability, tunable physico-chemical characteristics, selective dissolvability for many organic and inorganic materials, easy synthesis, and good stability to oxidative and reductive conditions.

In this work, novel nanoporous CER films were generated by polycyclotrimerization of dicyanate ester of bisphenol E in the presence of varying contents (from 20 to 40 wt. %) of 1-heptylpyridinium tetrafluoroborate ([HPyr][BF_4]) as a porogen, followed by quantitative extraction of the IL after complete high temperature CER network formation. Thus, the main idea was to check the influence of the porogen content on thermal stability of the nanoporous materials synthesized. Using the TGA technique, the values of the degradation temperature onset (T_{d1}), temperature of maximal degradation rate (T_{dmax}), temperature of 50 % mass loss ($T_{d50\%}$) and char residues were determined for all the nanoporous CER films synthesized. It was established that the films under investigation retained their chemical structure and thermal properties. One could conclude that the CER films could be promising materials for thermostable nanoporous membranes, selective adsorbents or filters, etc.

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