Preparation of Polymer Alloys Consisting of High Molecular Weight Benzoxazine and Bismaleimide

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Polybenzoxazines have been developed as a novel type of phenolic resins that can be afforded by the ring-opening polymerization of benzoxazines. Recently, we reported a preparation of high molecular weight benzoxazines (HMWBs) [1], which were synthesized from aromatic or aliphatic diamine and bisphenol A with paraformaldehyde. Toughness of cured films of the polybenzoxazines derived from HMWBs was greatly enhanced compared with those from low molecular weight monomers, and they showed excellent thermal stability. We also reported that polymer alloys of benzoxazine and bismaleimide (BMI) show much higher glass transition temperatures (T_gs) than those of each homopolymer [2], and their thermal stability was also enhanced with increasing the BMI content.

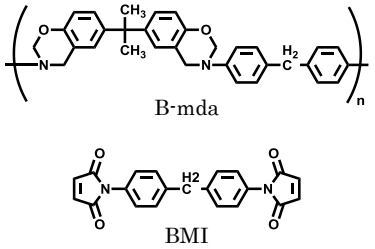
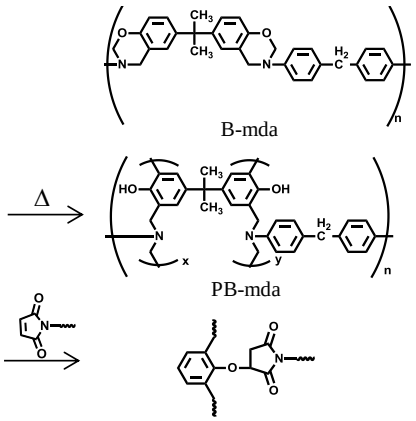


Fig. 1. Chemical structures of B-mda and BMI.

In this study, we report novel polymer alloy prepared by blending HMWB (B-mda) and BMI (**Fig. 1**). It was confirmed by the FT-IR and DSC analyses showed that the phenolic hydroxyl group (-OH) formed by ring-opening polymerization of B-mda well reacted with the double bond of BMI in addition to the auto-polymerization of BMI and the ring-opening polymerization of B-mda (**Scheme 1**). The subsequent cross-linking reactions which form ether (-O-) linkages endow improved toughness with the polymer alloy films than homo-BMI films. Moreover, viscoelastic and thermogravimetric analyses of the polymer alloys showed that the T_g and thermal stability were also enhanced with increasing the BMI content.



Scheme 1. Possible cross-linking reaction between PB-mda and BMI.

References

[1] Takeichi, T.; Kano, T.; Agag, T. *Polymer* **2005**,*46*,12172.
[2] Takeichi, T.; Saito, Y.; Agag, T.; Muto, H.; Kawauchi, T. *Polymer* **2008**,*49*,1173.