Electronic Supplementary Information

Thermally Resistant Unsaturated Polyester Resin with Low Dielectric Loss Based on Special Benzyl Alcohol Terminated Hyperbranched Polysiloxane for Producing High Efficiency Motors Using Vacuum Pressure Impregnation Technique

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Free volume is an important parameter for describing the structure of a polymer, which has great influences on the properties of the polymer. PALS technique is an effective method to evaluate the free volume of polymers, by which two important factors, o-Ps lifetime (τ_3) and o-Ps intensity (I_3), can be obtained. The τ_3 and I_3 values of Vi-HPSi/UP resins are shown in Fig.S1, it can be seen that with the addition of Vi-HPSi into UP resin, both τ_3 and I_3 reduce initially and then gradually increased with the content of Vi-HPSi increase. In detail, τ_3 reduces incipiently and reaches the minimum value (1.7558 ns) at 5 wt% Vi-HPSi, about 0.96 times that of UP resin (1.8324 ns). Then τ_3 increases gradually and reaches 1.8152 ns at 20 wt% Vi-HPSi. While I_3 reaches the minimum value (23.17 %) at 10 wt% Vi-HPSi, about 0.88 times that of UP resin (26.40 %), then increases gradually and reaches 25.16 %.

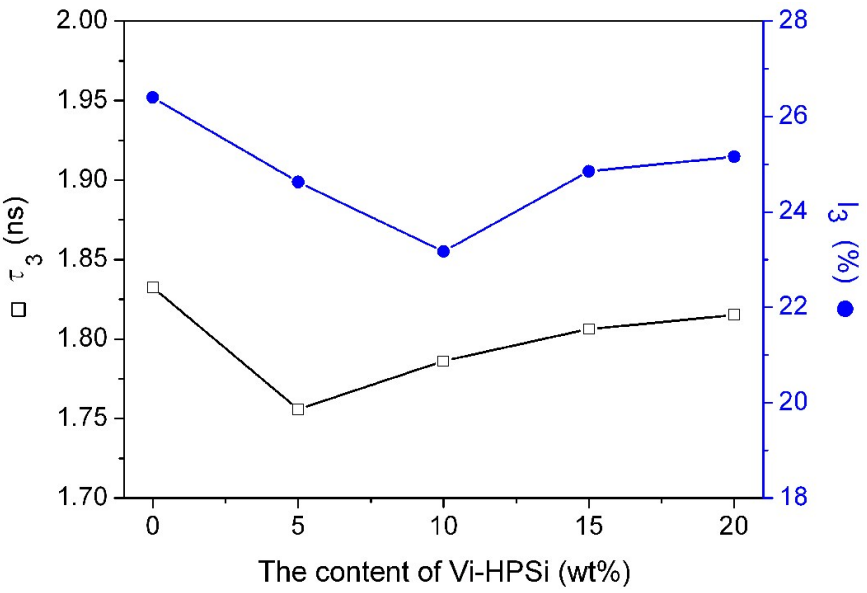

Fig. S1 τ_3 and I_3 values of Vi-HPSi/UP resins with different Vi-HPSi contents

It is known that τ_3 directly reflects the sizes of the free volume cavities and I_3 relates to the number of free volume sites in a material. From τ_3 and I_3, two other visual and useful parameters, the average volume of free cavities (V_h) and fractional free volume (f_{app}), can be calculated. [1, 2]

References

[1] R. C. McDonald, D. W. Gidley, T. Sanderson and R. S. Vallery, J. Membrane. Sci., 2009, 89–92

[2] M. F. Zeng, X. D. Sun, Y. Wang, M. Z. Zhang, Y. M. Shen, B. Y. Wang and C. Z. Qi, Polym. Adv. Techno., 2008, 19, 1664–1671.