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Structure-property relationship of vinyl-terminated oligo (2,6-dimethyl-1,4-phenylene ether)s (OPEs): Seeking a OPE with better properties

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Vinylbenzyl ether-terminated oligo(2,6-dimethyl-1,4-phenylene ether) (1) has been commercialized by Mitsubishi Gas Chemical in the name of OPE-2St. OPE-2St is used in high-frequency printed circuit board due to its low-dielectric characteristic after curing of vinyl groups. However, there is room for improvement in properties. In this work, we describe the preparation of three new OPEs: vinylbenzoate terminated OPE (2), 3,5-bis(vinylbenzyl ether) benzoate-terminated OPE (3) and 3,5-bis(vinylbenzyl ether)benzyl ether terminated OPE (4) and compare their fundamental material properties to (1). We discuss the effect of the number of vinyl groups (two or four) and the linker (benzyl ether or benzoate) on the properties of OPE thermosets. Through data analyses, we found that the thermoset of (3) shows the highest T_g , the highest modulus, the lowest height of $\tan\delta$, the lowest CTE, the highest oxygen permeation resistance, the lowest water absorption, the lowest dielectric constant and the second best level of thermal stability among four OPE thermosets. We also found that the toughness of thermoset of (3) can be significantly enhanced through the copolymerization with epoxy resin HP7200 through the exchange reaction of benzoate and epoxy groups. In short, through properties comparison of four thermosets of (1-4), we demonstrate that (3) shows promising properties compared with the commercial (1).

Biography

Ching Hsuan Lin has completed his PhD from Department of National Chemical Engineering, Cheng Kung University, Taiwan in 1999. He is a Full Professor of National Chung Hsing University, Taiwan. He has published more than 100 papers in reputed journals and has been serving as a Guest Editor of Polymers.

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