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# Supporting Information

# for

# Platinum-free High Adhesion LED Encapsulant with High Thermal Stability and High Refractive index

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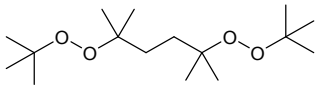

**Fig. S1** Chemical structure of 2,5-Bis-(*tert*-butylperoxy)-2,5-dimethylhexane, which was used for radical initiator for HAEncap.

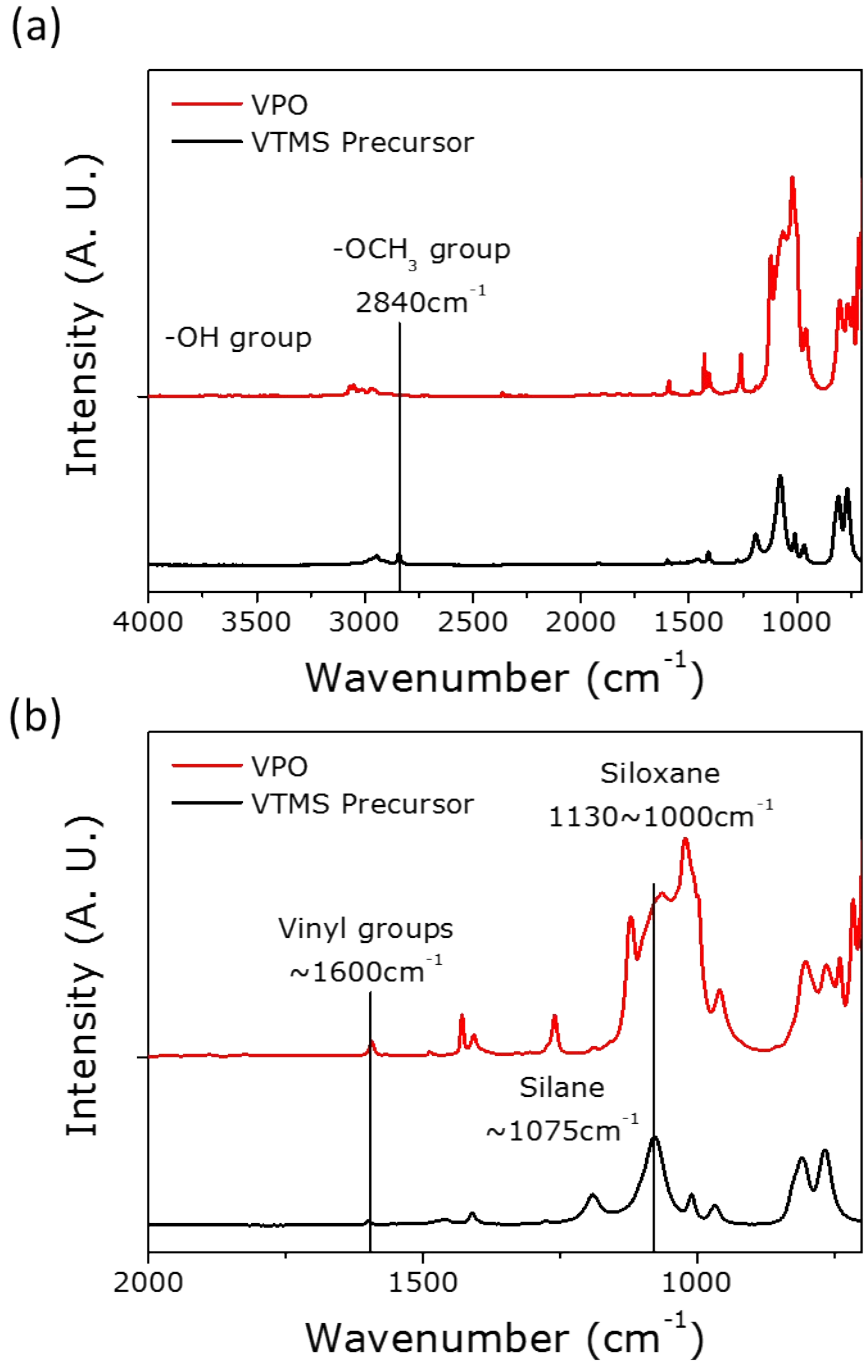


**Fig. S2** FT-IR absorption spectra of VPO and VTMS precursor in (a) 4000~700cm$^{-1}$ range and (b) 2000~700cm$^{-1}$ range. As a result of sol-gel condensation between VTMS and DPSD, methoxy groups (-$OCH_3$) in VTMS are totally disappeared while vinyl groups are remained. In addition, VTMS precursor shows a single sharp peak at 1075cm$^{-1}$, which indicates a silane precursor, whil VPO shows broad peak around 1130~1100cm$^{-1}$, which indicates siloxane bond. These results suggest a successful sol-gel condensation between VTMS and DPSD have been occurred.

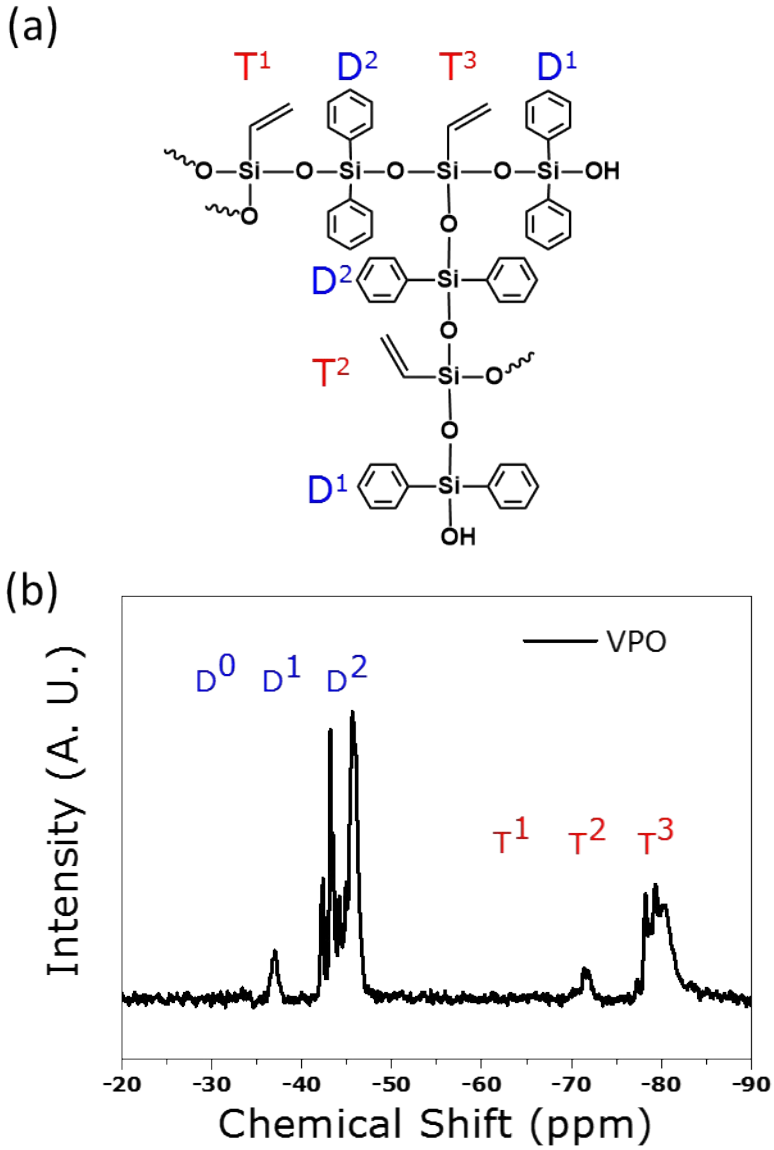


**Fig. S3** (a) Scheme of structural environment of Si atoms in VPO resin and their nomenclature, $D^n$ and $T^n$. (b) $^{29}Si$ NMR spectra of VPO. Note that there is no remaining $D^0$ or $T^0$ species after sol-gel condensation between VTMS and DPSD.

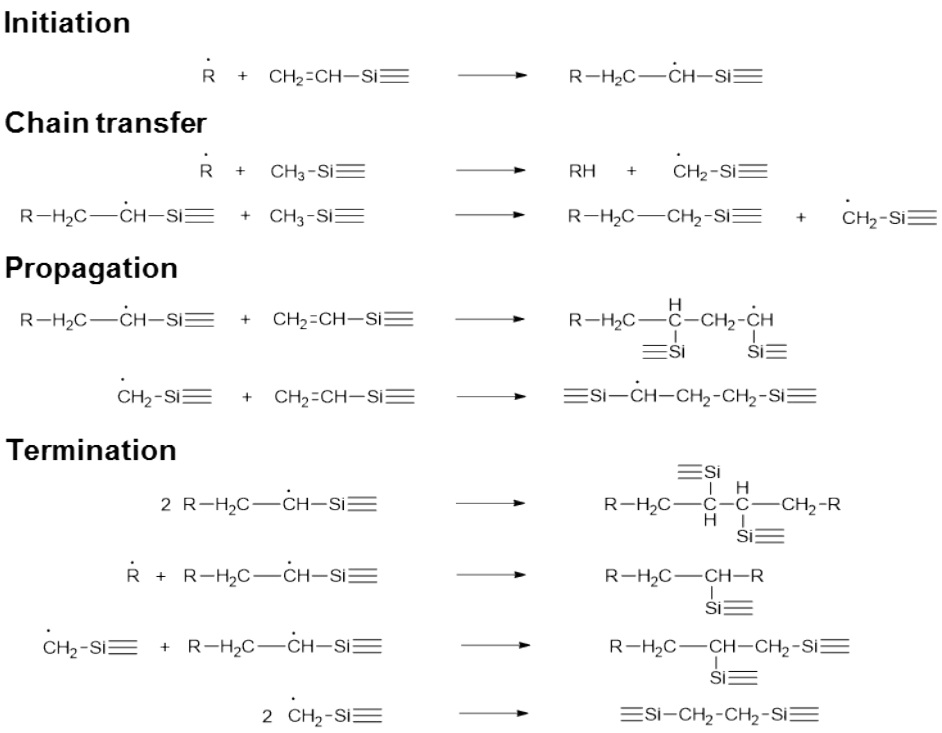


**Fig. S4** Bond forming chemistry of the radical polymerization between vinyl groups and methyl groups. It should be noted that the dissociation of vinyl groups occurs at the initial step.

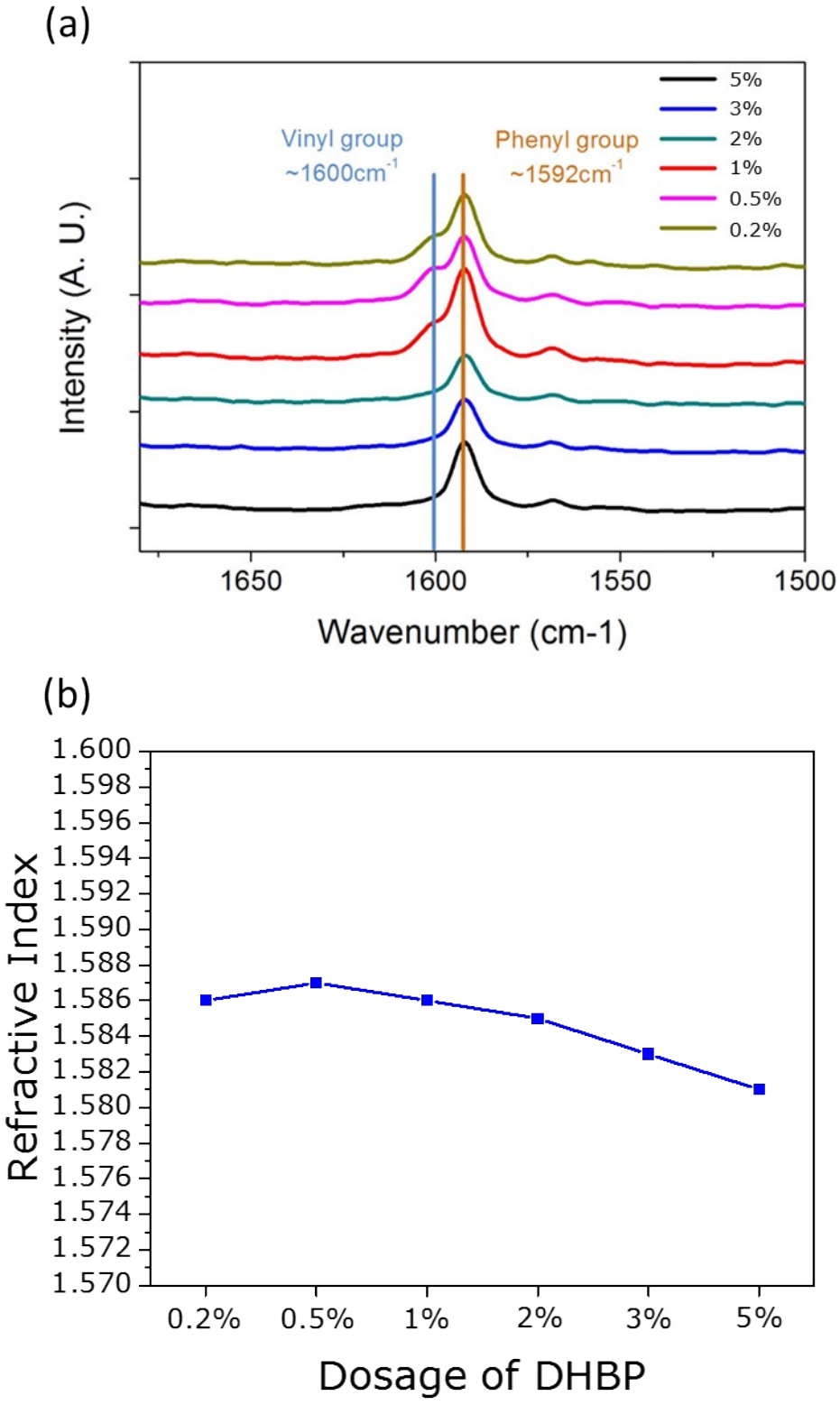


**Fig. S5** (a) FT-IR spectra of HAEncap with varying amount of DHBP. It should be noted that remaining vinyl groups mean the incomplete curing of HAEncap. (b) Refractive index of HAEncap with varying amount of DHBP. The refractive index of DHBP was 1.585 when the dosage was 2%.

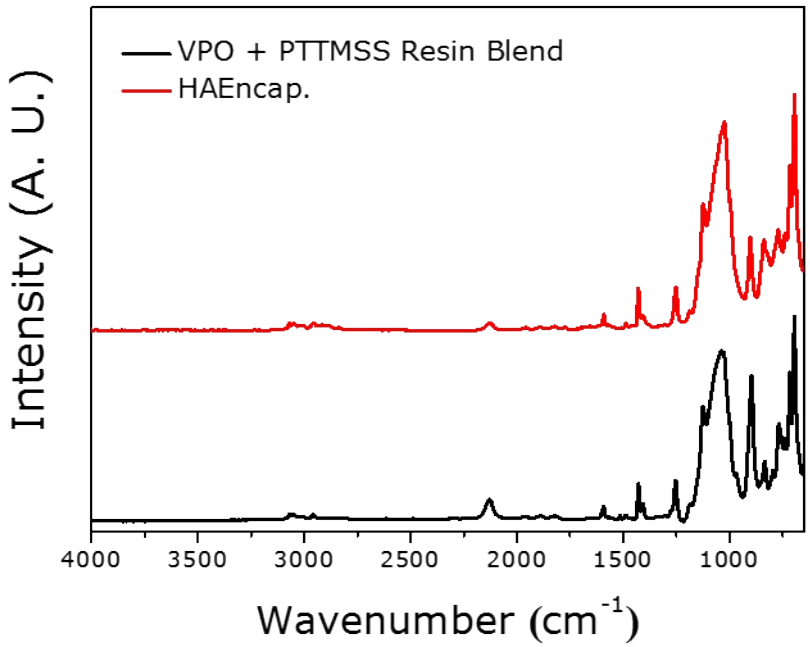


**Fig. S6** FT-IR spectra of HAEncap and the resin blend of VPO and PTTMSS in 4000~650cm$^{-1}$ wavenumber range.

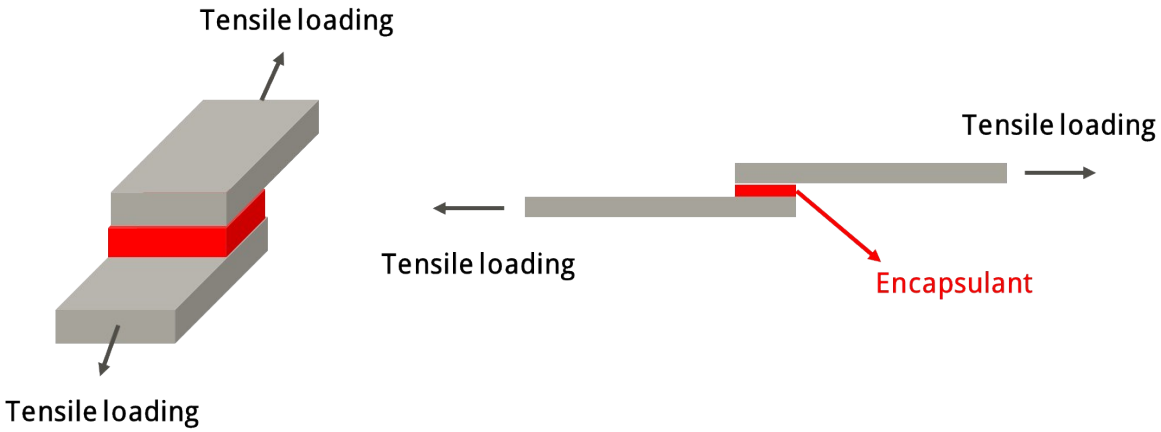


**Fig. S7** Schematic illustration of lap shear test for the comparison of adhesion strength among LED encapsulants.