

Supporting Information

Optically Recoverable, Deep Ultraviolet (UV) Stable and Transparent Sol-Gel Fluoro Siloxane Hybrid Material for UV LED Encapsulant

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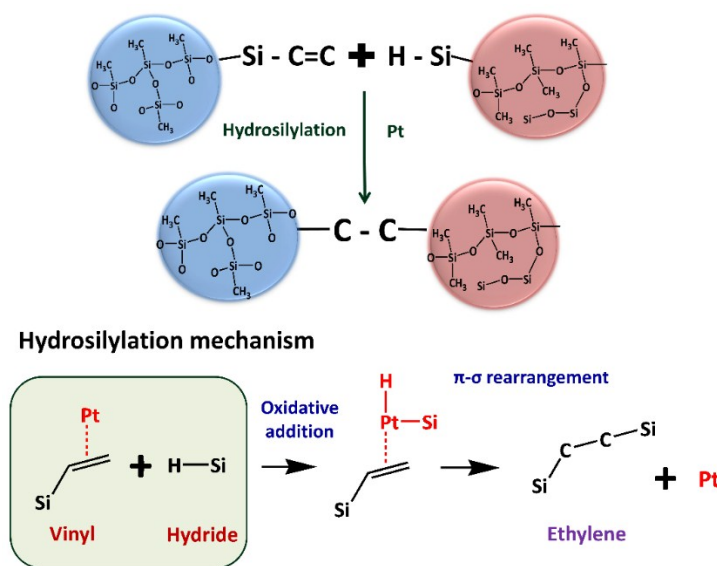


Fig. S1 Hydrosilylation curing mechanism of carbon-carbon double bonds (C=C, vinyl) and silicon-hydrogen bonds (Si-H, hydride), which are attached to the oligosiloxane resins. Thermal hydrosilylation reaction is promoted by highly active platinum catalysts, such as Karstedt's catalysts. C-silylation connects π -bonds in the vinyl groups and σ -bonds in the hydride groups through π - σ rearrangement according to the Chalk-Harrod mechanism.²⁵⁻²⁸ The cross-links (-CH₂-CH₂-) between siloxane network was formed via hydrosilylation reaction of vinyl and hydrogen groups.

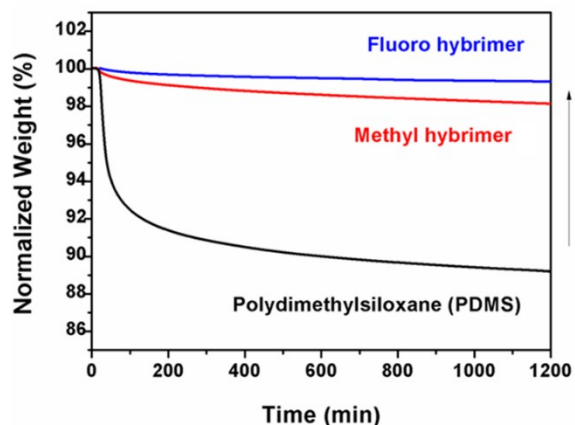


Fig. S2 Isothermal TGA spectra of the PDMS, methyl hybrimer and fluoro hybrimer bulk at 300 °C in N₂. The fluoro hybrimer, replacing methyl groups with vinyl, fluorine groups and siloxane bonds, has increased number of cross-linking points compared to methyl hybrimer and PDMS. Thus, long-term thermal decomposition of the organic groups are inhibited.

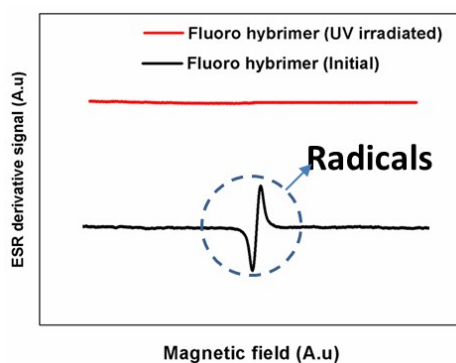


Fig. S3 Electron spin resonance (ESR) spectra of the fluoro hybrimer before and after UV irradiation. In general, free radicals are observed by spin signals in ESR spectra. An ESR, which has been widely used to investigate the radicals in irradiated materials with side groups such as methyl, vinyl, and hydrogen groups, are measured before and after UV irradiation of the fluoro hybrimer. This analysis provides supporting information for the presence of radical species in the hybrimer.

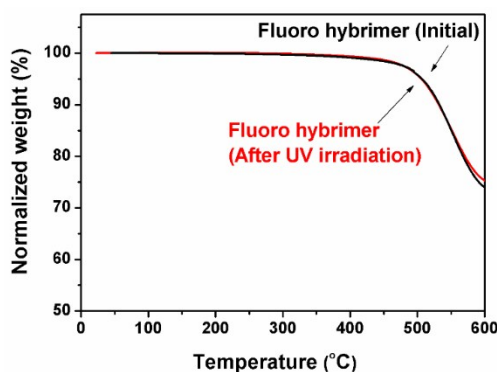


Fig. S4 TGA spectra of the fluoro hybrimer before and after UV irradiation. The presence of strong carbon-fluorine bonds and siloxane network, highly cross-linked and branched structure, which is formed by complete condensation and hydrosilylation reaction of precursors, effectively inhibited the cleavage of organic phases during elevation of temperature.