

Supporting Information

Mussel Inspired Modification for Aluminium Oxide/Silicone Elastomer Composites with Largely Improved Thermal Conductivity and Low Dielectric Constant

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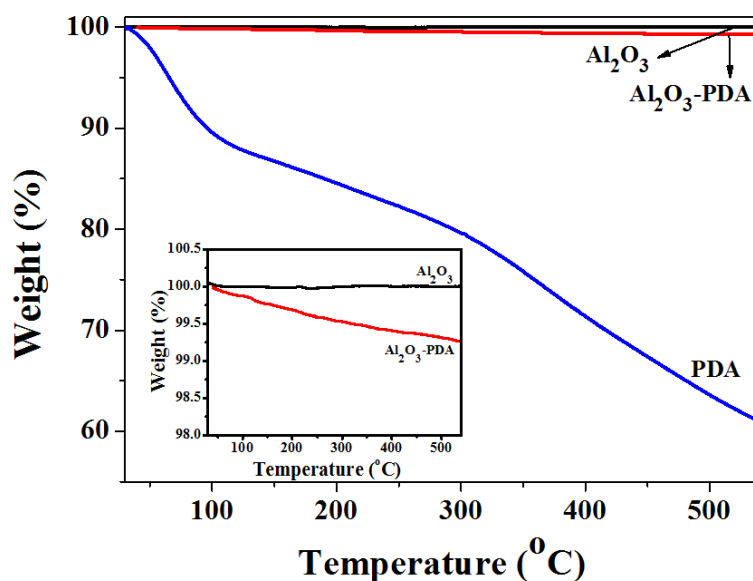


Figure S1 TG curves of Al₂O₃, Al₂O₃-PDA nanoparticles, and pure PDA.

The thermal decomposition of Al₂O₃, Al₂O₃-PDA particles, and pure PDA in nitrogen atmosphere are shown in Figure S1. As the samples are heated to 540 °C, the weight loss of Al₂O₃-PDA is between the weight of pure PDA and pristine Al₂O₃, demonstrating the PDA successfully deposition on surface of Al₂O₃ particles. The PDA amount of on the surface of Al₂O₃ particles is 1.89%, according to calculation of TGA and gravimetric method.

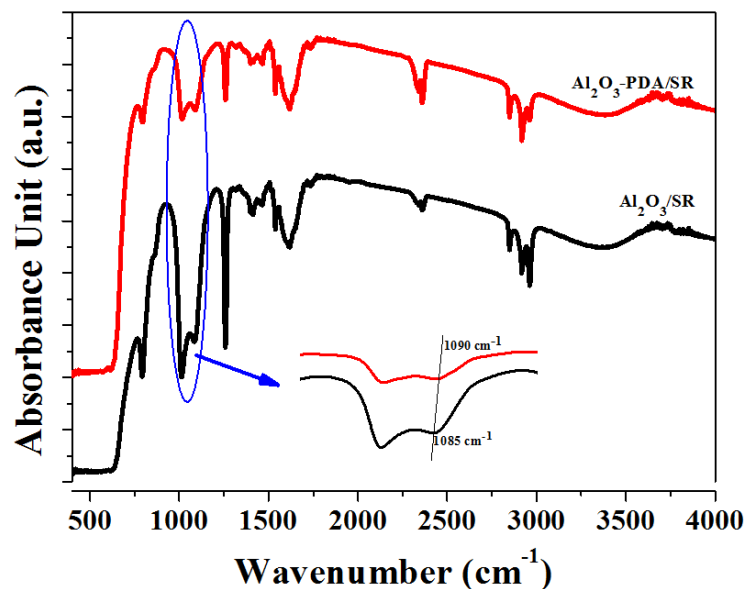


Figure S2 FTIR spectra of 30 vol % $\text{Al}_2\text{O}_3/\text{SR}$ composites and 30 vol % Al_2O_3 -PDA/SR composites.

Figure S2 shows the FTIR spectra of 30 vol % $\text{Al}_2\text{O}_3/\text{SR}$ and 30 vol % Al_2O_3 -PDA/SR composites. The $\text{Al}_2\text{O}_3/\text{SR}$ composites show the absorption peaks at 1085 cm^{-1} , which are attributed to Si-O-Si symmetric stretch. However, this peak shifts to higher wavenumber in the 30 vol % Al_2O_3 -PDA/SR composites, attributed by the formation of hydrogen bonding between the dopamine and SR. In addition, in previous studies, many researchers also demonstrated that dopamine can interact strongly with metal oxides and silicone rubber by hydrogen bonding [1, 2]. It is demonstrated that the PDA acts as a bridge-link between interfaces of ceramic nano-particles and polymer matrix to eliminate the aggregate formation.

References

1. Lin, M. F., Thakur, V. K., Tan, E. J., Lee, P. S., Surface functionalization of BaTiO₃ nanoparticles and improved electrical properties of BaTiO₃/polyvinylidene fluoride composite, *RSC Adv.* **2011**, *1* (4), 576-578.
2. Liang, J., Betts, A., Kennedy, D., Jerrams, S., Improving the electromechanical performance of dielectric elastomers using silicone rubber and dopamine coated barium titanate, *Mater. Design* **2015**, *85*, 733-742.