Supporting Materials for

Transparent anhydride-cured epoxy nanocomposites reinforced with polyaniline stabilized nanosilica

Hongbo Gu,[a,*] Jiang Guo,[b] Huige Wei,[c] Xingru Yan,[b] Daowei Ding,[b] Xi Zhang,[c] Qingliang He,[b] Sruthi Tadakamalla,[c] Xuefeng Wang,[a] Thomas C. Ho,[c] Suying Wei[c,*] and Zhanhu Guo[b,c,*]

[a]Shanghai Key Lab of Chemical Assessment and Sustainability, Department of Chemistry, Tongji University, Shanghai 200092, People's Republic of China

[b]Integrated Composites Laboratory (ICL), Department of Chemical & Biomolecular Engineering, University of Tennessee, Knoxville, Tennessee, 37966, USA

[c]Department of Chemistry & Biochemistry and Dan F. Smith Department of Chemical Engineering, Lamar University, Beaumont, Texas, 77710, USA

[*]Corresponding author:

E-mail: hongbogu2014@tongji.edu.cn (H. G.),
zguo10@utk.edu (Z. G.),
suying.wei@lamar.edu (S. W.)

S. 1 Chemical Structure Characterization of the Functionalized NanoSilica

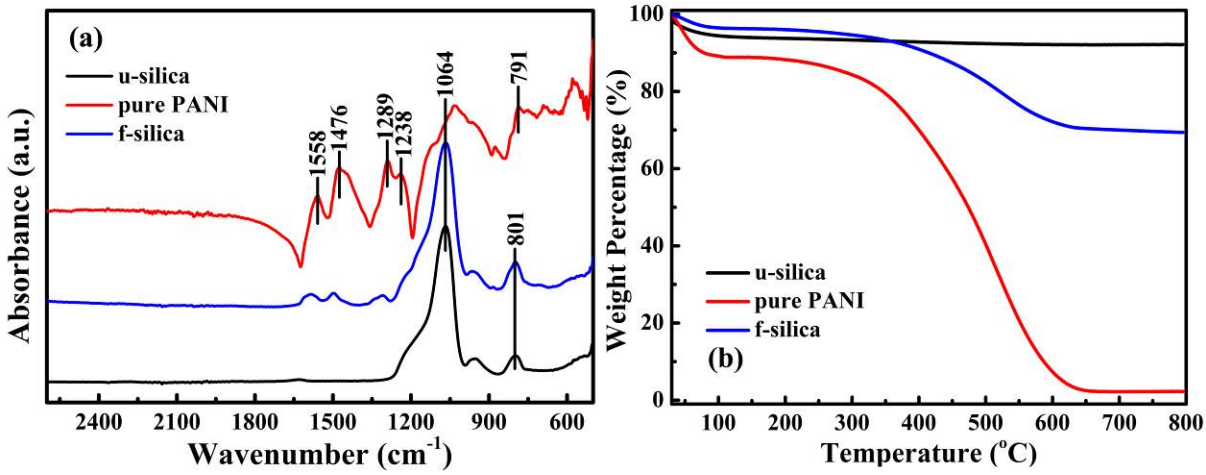

Fig. S1. (a) FT-IR spectra, and (b) TGA (air condition) of u-silica, pure PANI, and f-silica.

S. 2 Viscosity of DER 331 Resin NanoSuspension with PANI Nanoparticles

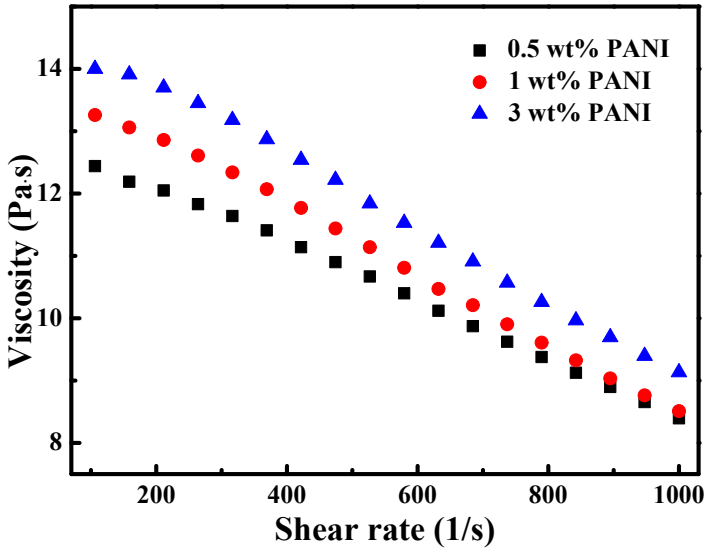

Fig. S2. Viscosity *vs*. shear rate of the epoxy resin nanosuspensions filled with different loadings of PANI nanoparticles at 25 °C.

S. 3 Temperature Dependent Viscosity of DER 331 Resin Monomer

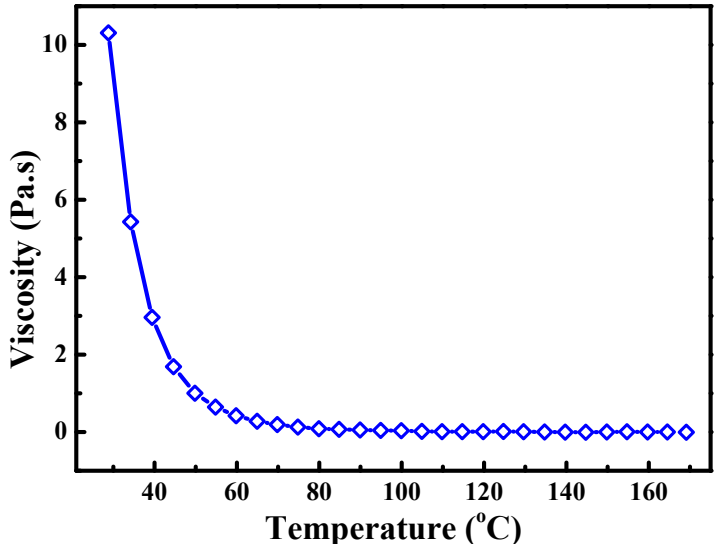

Fig. S3 Viscosity *vs*. Temperature of DER 331 resin monomer.

S. 4 Comparison of Curing Process

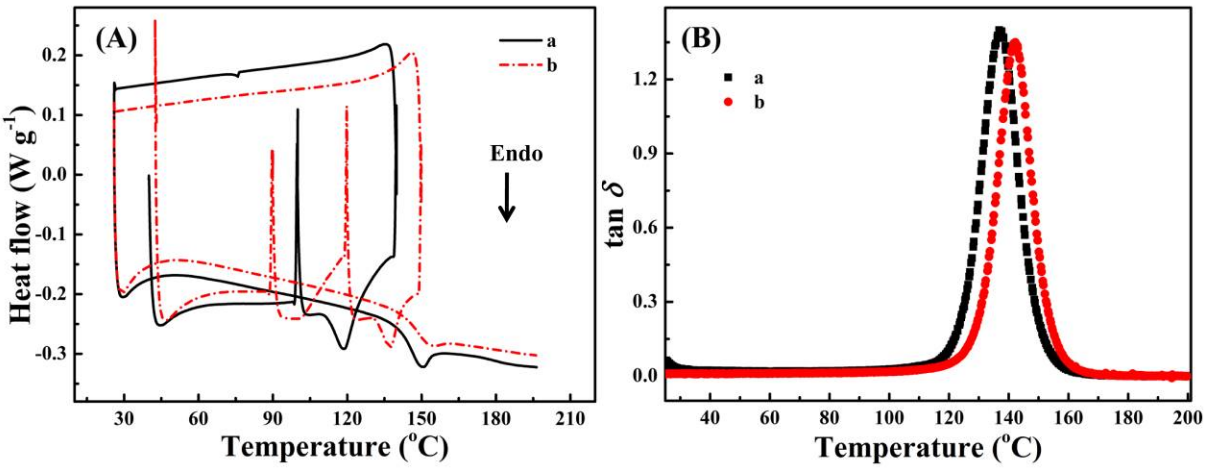

Fig. S4. For curing: (A) DSC curves; and (B) tan δ *vs*. temperature of (a) at 100 °C ~ 3 h, and 140 °C ~ 6 h; and (b) at 90 °C ~ 2 h, 120 °C ~ 2 h, and 150 °C ~ 5 h.

The DSC measurements of (**a)** process were carried out under a nitrogen flow rate of approximately 20 mL min^{-1} at a heating rate of 10 °C min^{-1} from 25 to 100 °C; and an isothermal process at 100 °C was continued for 180 min. Then the temperature was increased to 140 °C at a

heating rate of 10 ^{o}C min^{-1} and an isothermal process was conducted at 140 ^{o}C for 360 min. After that, the temperature was decreased to 25 ^{o}C at a rate of 10 ^{o}C min^{-1} and then the temperature was increased from 25 to 200 ^{o}C at a heating rate of 10 ^{o}C min^{-1}.

The DSC tests of (**b)** process were obtained under a nitrogen flow rate of approximately 20 mL min^{-1} at a heating rate of 10 ^{o}C min^{-1} from 25 to 90 ^{o}C, and an isothermal process at 90 ^{o}C was continued for 120 min. Then the temperature was increased to 120 ^{o}C at a heating rate of 10 ^{o}C min^{-1} and an isothermal process was conducted at 120 ^{o}C for 120 min. After that, the temperature was increased to 150 ^{o}C at a heating rate of 10 ^{o}C min^{-1} and an isothermal process was conducted at 150 ^{o}C for 240 min. Finally, the temperature was decreased to 25 ^{o}C at a rate of 10 ^{o}C min^{-1} and then the temperature was increased to 200 ^{o}C at a heating rate of 10 ^{o}C min^{-1}.

S. 5 Thermogravimetric Analysis (TGA)

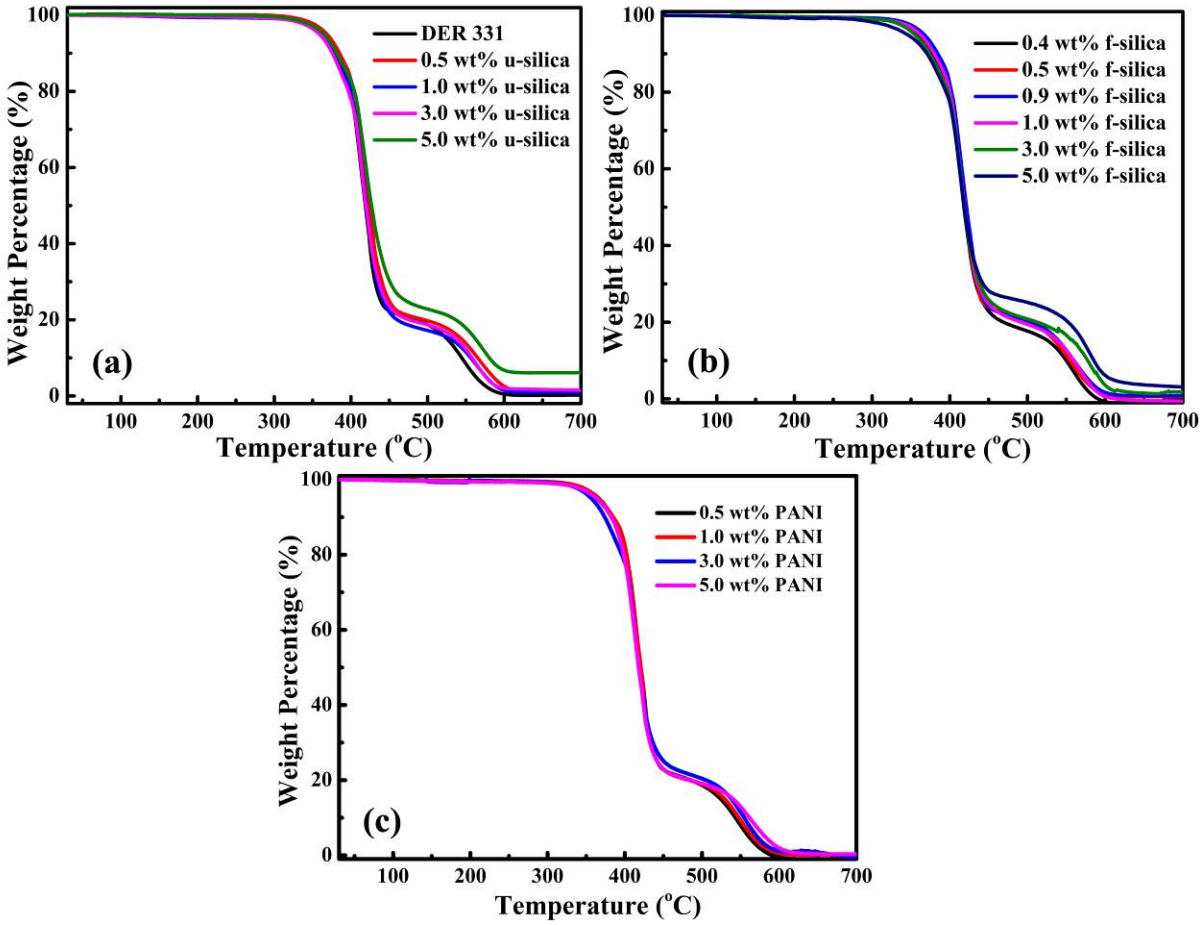

Fig. S5. TGA curves of (a) cured DER 331 resin and its nanocomposites with different u-silica loadings and (b) nanocomposites filled with different f-silica loadings (c) nanocomposites with different loadings of PANI nanoparticles.

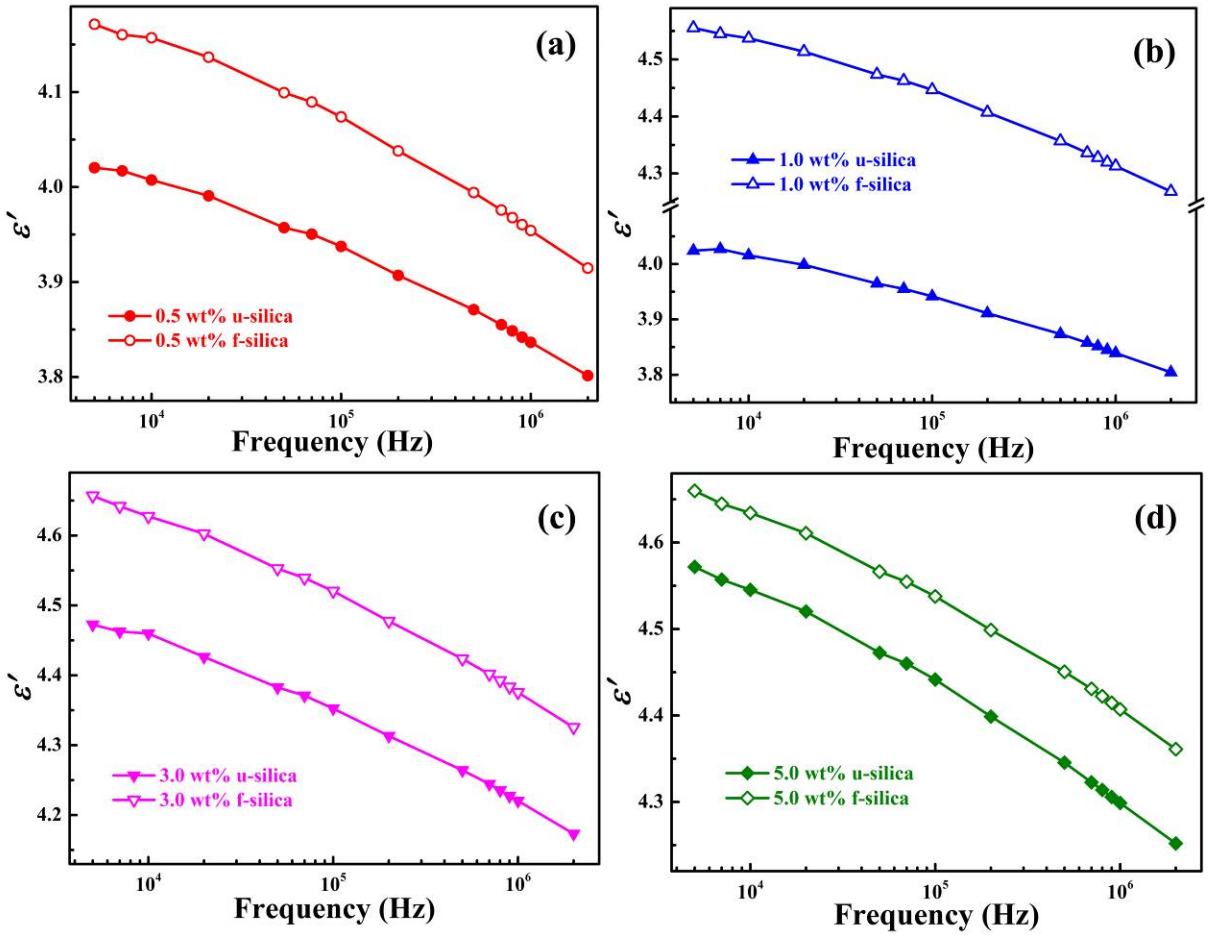

Fig. S6. Effect of surface treatment on the real permittivity (ε') for the cured DER 331 nanocomposites filled with different silica loadings.

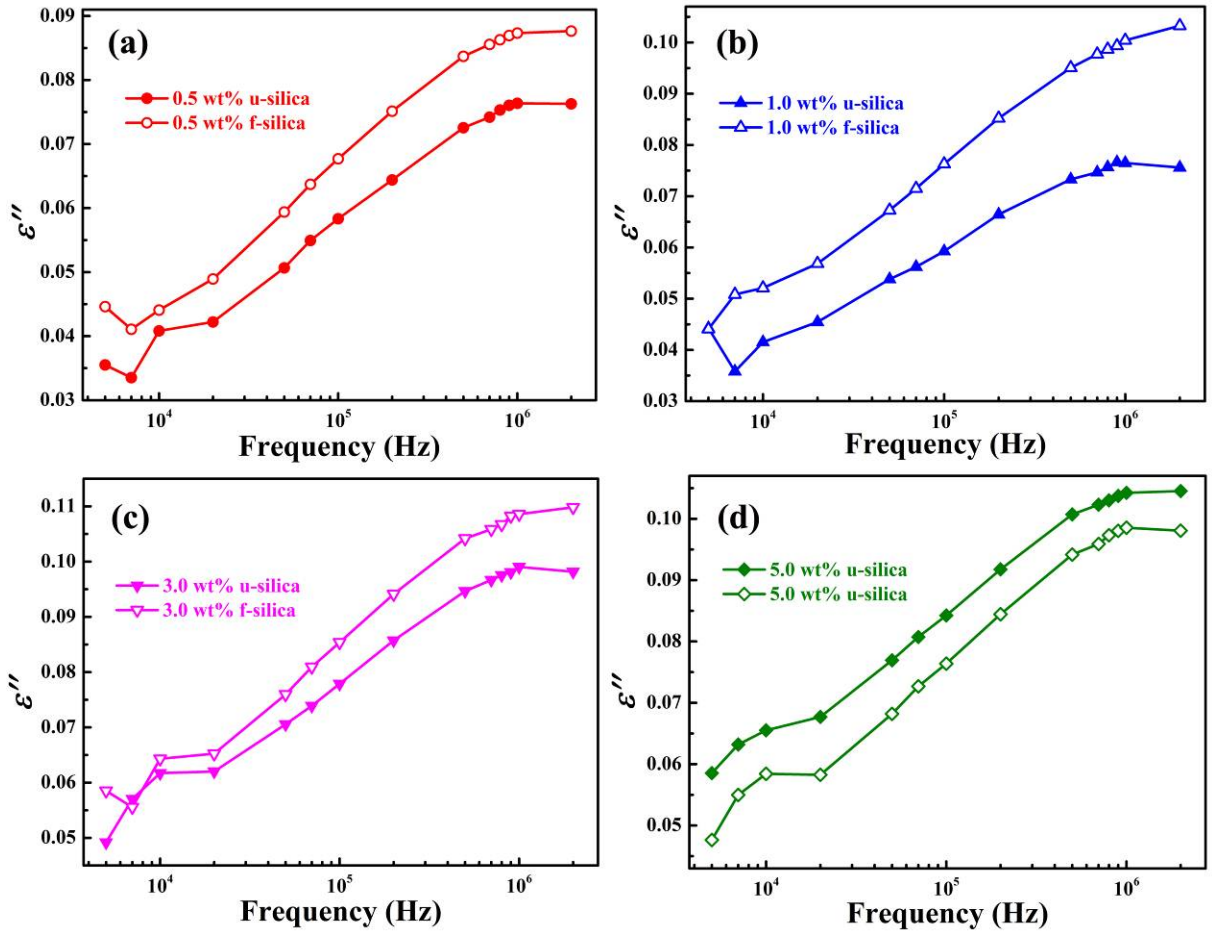

Fig. S7. Effect of surface treatment on the imiginary permittivity (ε'') for the cured DER 331 nanocomposites filled with different silica loadings.

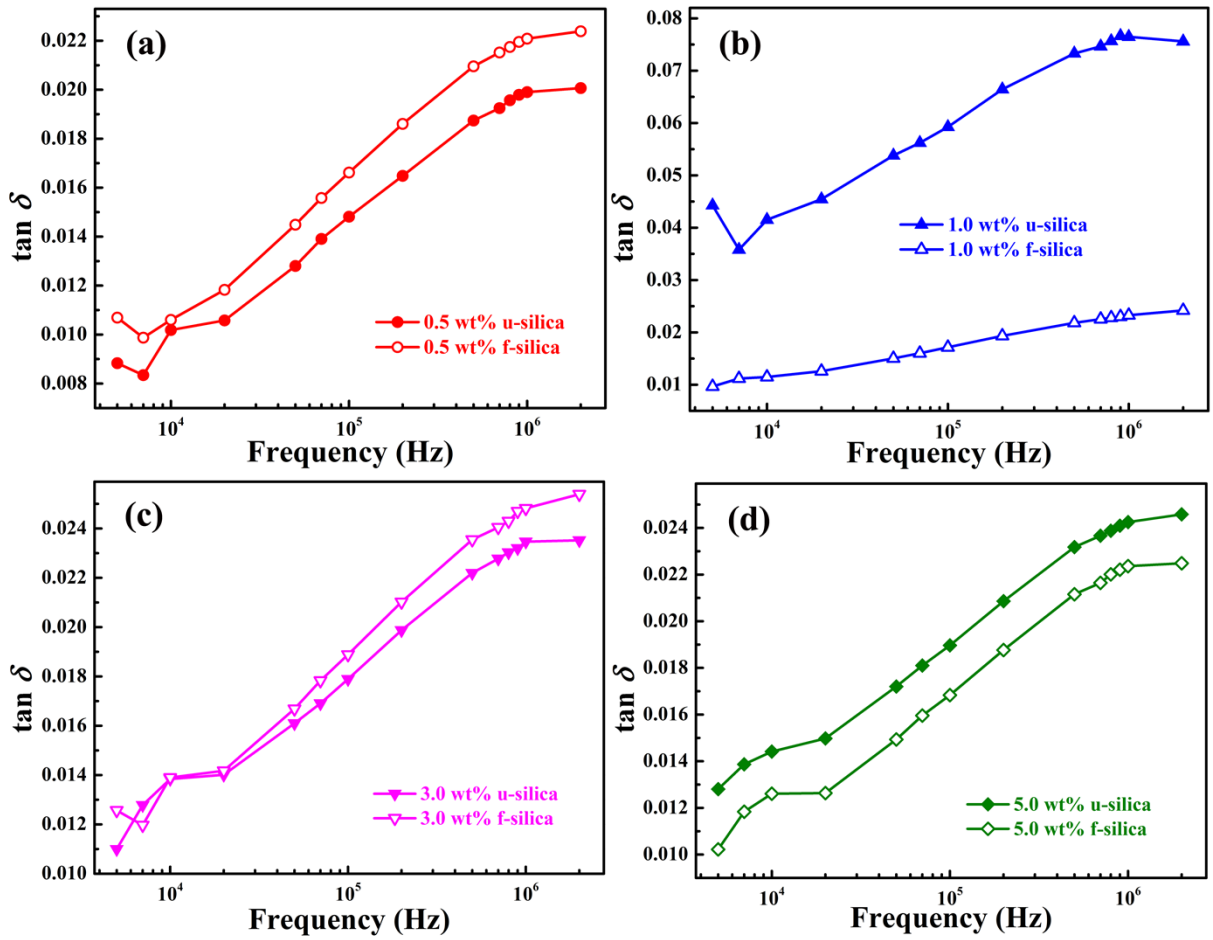

Fig. S8. Effect of surface treatment on the tanδ for the cured DER 331 nanocomposites filled with different silica loadings.

S.6 Transparent Tests for DER 331 Nanocomposites Filled with PANI Nanoparticles

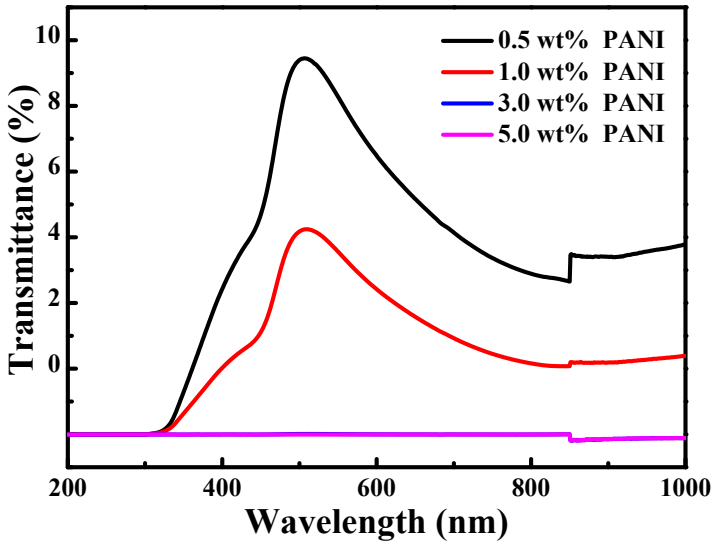

Fig. S6. Transmittance curves of the cured DER 331 resin filled with different PANI nanoparticles.