Electronic Supplementary Material (ESI) for RSC Advances


# Thermomechanical Behavior of Hydrogen-Bond Based Supramolecular Poly(ε-Caprolactone)-Silica Nanocomposites

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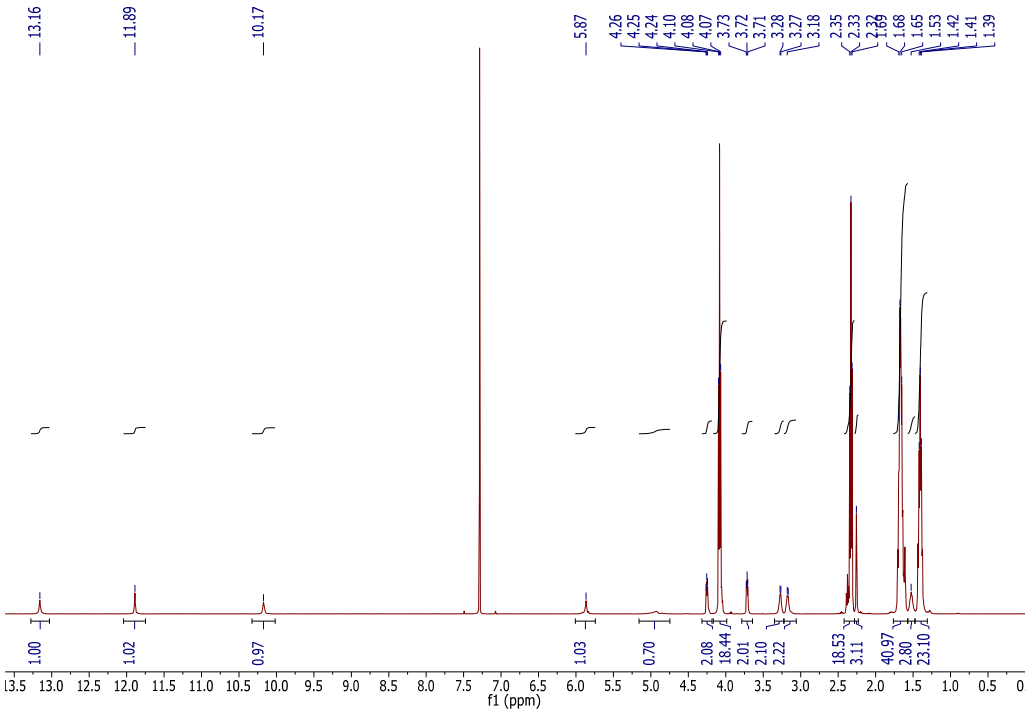
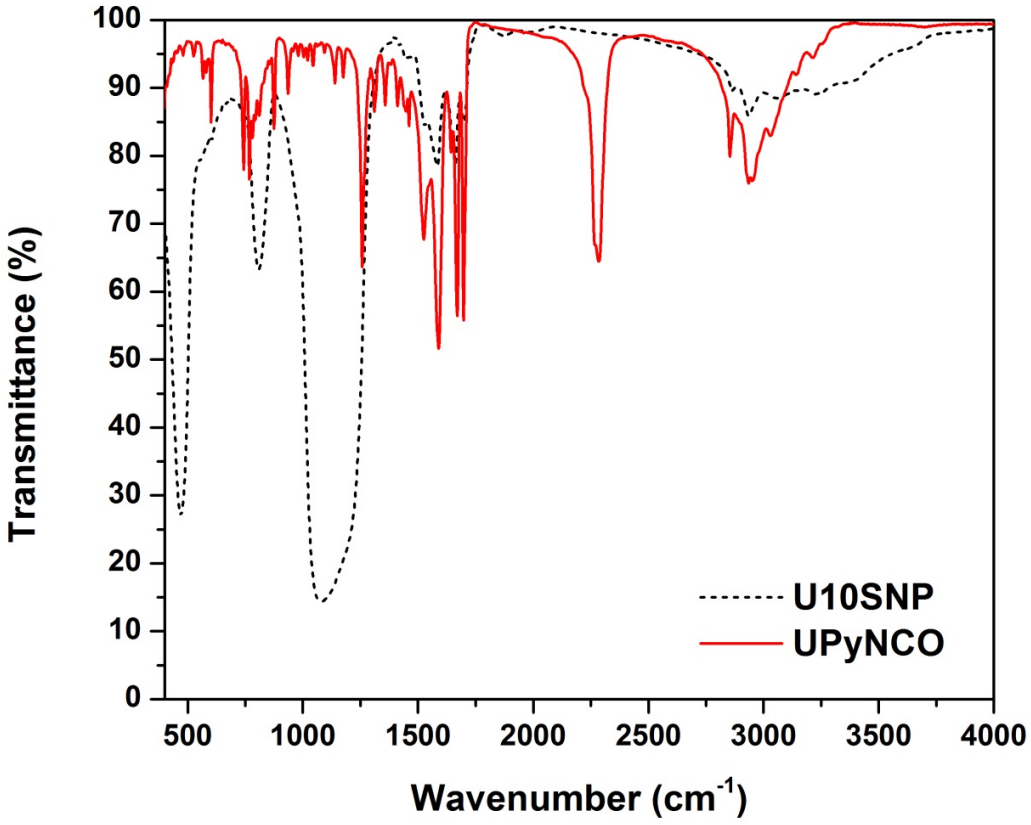
## Supplementary Information

## NMR




**Supplementary Information 1.** $^{1}$H-NMR for UPCL supramolecular polymers.

**FT-IR**




**Supplementary Information 2.** FT-IR spectra for UPyNCO and UPy functionalized silica nanoparticles.

**Representative Films**

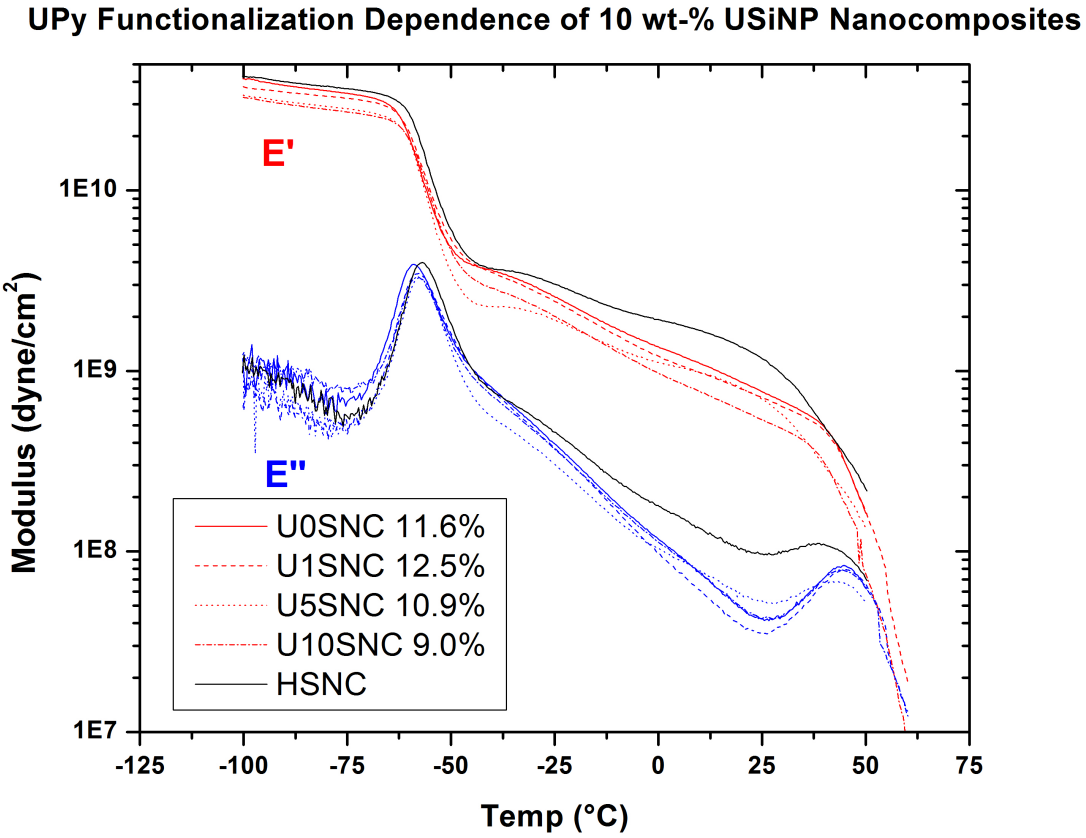
Representative images of thick films made via melt press are shown below. Low and high molecular weight PCL films are shown for comparison to the supramolecular UPCL examined in this work.

**Supplementary Information 3.** Melt processed UPCL film.

**Supplementary Information 4.** Melt processed PCL, Mn ~ 80k.

**Supplementary Information 5.** Melt processed PCL diol, Mn ~ 2k. The prepolymer is waxy and brittle and breaks before it can be examined by DMA.

**HSNP Nanocomposite Dynamic Modulus**

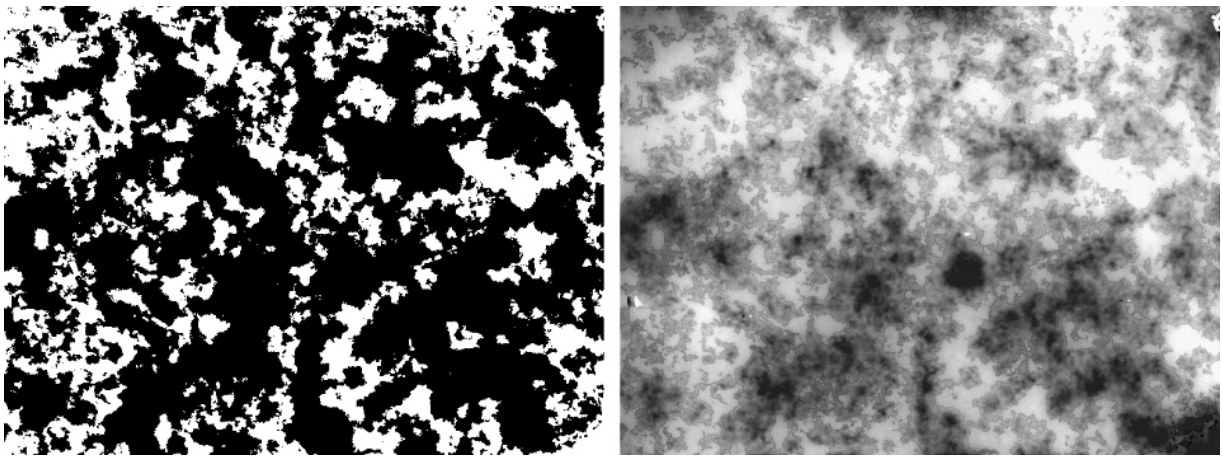



**Supplementary Information 6.** Dynamic temperature ramp experimental results for nanocomposites made using hexyl surface functionalized silica nanoparticles. USNC composites are included for comparison.

**Image Analysis**

All image analysis was performed using ImageJ analysis software. After converting images to 8 bit black and white image files, the background was subtracted to allow for more consistency between analyzed images. The images were then thresholded to highlight regions of the image that contained nanoparticles. The exact threshold value was varied slightly from image to image to achieve accurate measurements. The images were then converted to binary, and the number of white and black pixels obtained from the image histogram. Fraction filled can then be calculuated from the pixel counts. Finally, in order to visually confirm the accuracy of the measurement, the binary image was converted to an outline, which was overlayed over the original TEM image. Values reported in Figure 7 are calculated from the average of three TEM micrographs, and error bars show the 95% confidence interval.

Below, we show a representative processed binary image and overlay.



**Supplementary Information 7.** TEM image of U1SNC 10% after image processing (left) and an overlay of the processed image on the original image (right).