# Self-assembled Polydiacetylenes on Nanographene for Construction of Hybrid Sensing Materials

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Abstract

Polydiacetylenes (PDA) are a class of chromic polymers used extensively in sensing applications. These polymers are ideal for sensing applications because they have an easily monitored blue to red phase-transition that can be induced by heat, pH, organic solvents or pressure.[1] The monomer readily self assembles on surfaces, interacts with polymers, and forms micelles in solution.[2] Unfortunately, the precise alignment of the monomers required for polymerization leads to inhomogeneity and incomplete polymerization in cast films and hybrids.[3] Understanding how these monomers assemble on specific substrates and in films is important as PDAs have potential applications in nonlinear optics, photo-detectors and biological sensing devices.[4] In this work we have fabricated composites of nanographene (nG) and poly(10,12-pentacosadiynoic acid (pPCDA) a thermochromic polydiacetylene. Experiments measuring the reversible blue to red phase change temperature range of these hybrids have been completed up to 135 °C. The chromic reversibility of the composite is maintained at temperatures from 65 - 135 °C. Scanning Transmission X-ray Microscopy (STXM) using synchrotron radiation was used for mapping these hybrid systems which provided local information of bonding environments and elemental mapping of significant regions in the pPCDA-NG hybrid. Resonant Raman spectroscopy was used in this study to determine the phase of the polymer while assembled on the graphitic substrate. This study addresses the difficulties in the construction and characterization of self assembled nanocomposites and contributes solutions that are applicable to a broad range of systems.

## REFERENCES

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[2] Zhang, P., Zhang, C. & Shu, B. Sensors Actuators B: Chemical, 236 (2016) 27-34
[3] Huo, J. et al., Applied Surface Science 423 (2017) 951–956
[4] Yan, Q. et al., Chemical Communications, 16 (2010) 2781-2783

## FIGURES

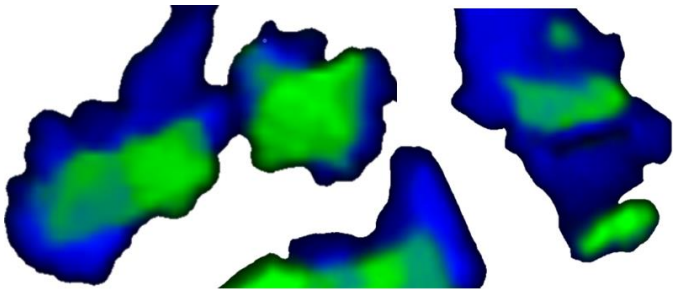

**Figure 1:** Scanning transmission X-ray microscopy images of hybrids showing areas of nanographite (green) and polydiacetylene (blue).