

Initiated CVD (iCVD) Polymerization in the LC to Synthesize Polymer Particles

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Principal Investigator(s): Rong Yang

User(s): Shiqi Li; Soumyamouli Pal

Affiliation: Smith School of Chemical and Biomolecular Engineering, Cornell University

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Contact: ryang@cornell.edu, sl2869@cornell.edu; sp2476@cornell.edu

Primary CNF Tools Used: Leica 300 CPD

Abstract:

In our prior work, we have demonstrated that the morphology of shape-controlled polymer particles of DVB is governed by the LC-polymer interfacial energies and the LC elastic energy. However, the full spectrum of morphologies that can be accessed by iCVD-in-LC remains to be fully understood. Here, we address the objective of synthesizing polymeric morphologies with tailored chemistries by using a new monomer, glycidyl methacrylate (GMA). One of the technical bottlenecks of characterizing the products is removing the LC before using SEM. To keep the morphology of polymer products and remove LC at the same time, we use Critical point drying to obtain the polymers after deposition.

Summary of Research:

GMA monomer: We performed iCVD polymerization reactions into the E7 LC template in its nematic phase using GMA as the monomer and TBPO as the initiator. Two deposition conditions were explored in detail, with varying monomer and initiator partial pressures. After crosslinking the linear polymer materials in LC, we used critical point drying (in Figure 1) to remove the LC and maintained most of the polymers deposited in LC. Then we used SEM to observe material structures. Templated by elasticity of LC, the polymer formed nanoparticle assemblies (Figure 2) with nanoscale diameter and microscale length.

Conclusions and Future Steps:

Anisotropic nanoparticle assemblies of pGMA were obtained through the iCVD-in-LC process. This morphology is different from the pDVB microparticles in our previous work. This gave us more information about polymeric morphologies with tailored chemistries that could be obtained in LC.

References:

[1] Jain et al., Sci. Adv. 10, eadp5573 (2024).

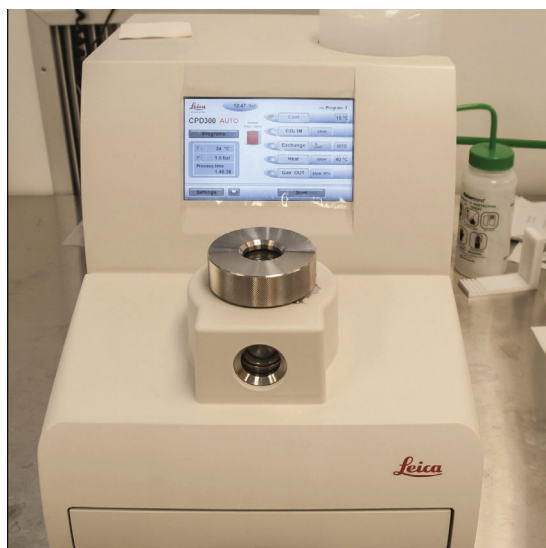


Figure 1: Photo of critical point drying.

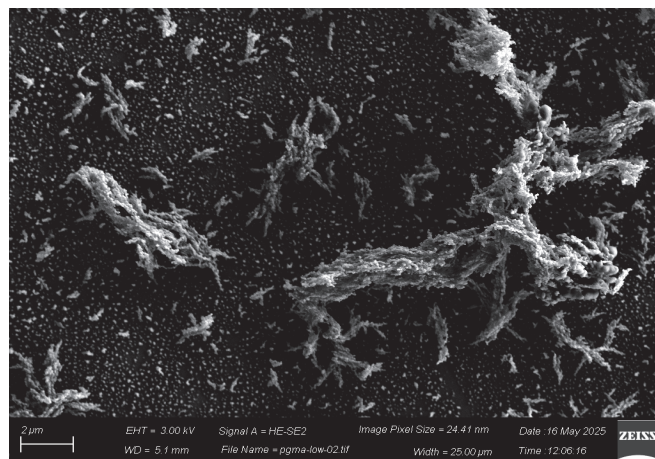


Figure 2: SEM image of pGMA material obtained in LC.

