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## Hybrid fibers with substantial filler contents through kinetically arrested phase separation of liquid jet

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Polymeric materials of structural hierarchy and compositional heterogeneity have attracted wide interest for their potential applications as biomaterials, energy storage devices, and surface coatings. Electrospinning, a simple yet versatile technique, has great potential for developing such materials by controlling the electrospinning process under non-equilibrium conditions. In this study, poly( $\epsilon$ -caprolactone) (PCL)/polyhedral oligomeric silsesquioxane (1-propylmethacrylate)-heptaisobutyl substituted (m-iBuPOSS) hybrid fibers with interesting nanopapilla and wrinkled surface features were successfully electrospun from 10:0 to 5:5 by mass PCL/m-iBuPOSS solutions. It is worth mentioning that uniform POSS-filled fibers have been previously reported for only low loadings of POSS as traditional nanofillers. In contrast, this study reports, for the first time, hybrid fibers with substantial POSS loadings up to 50 wt%. The low-surface-energy m-iBuPOSS was used as an essential modulator for the phase separation of the liquid jet along the radial direction. The m-iBuPOSS surface segregation was coupled with rapid solvent evaporation that “froze” PCL chains in the outmost layer prior to drying of the inner phase, which eventually gave rise to a unique fiber architecture composed of a POSS-rich composite crust and a PCL-rich inner phase. When the POSS-rich crust was removed with hexane, the fiber architecture was clearly revealed through a combination of X-ray photoelectron spectroscopy (XPS), Raman spectroscopy, and X-ray diffraction (XRD). This study provides new insight into the effect of rapid solvent evaporation coupled with surface-directed phase separation in the liquid jet and its implications on designing novel heterogeneous materials.

### Biography

Bingbing Li (PhD, Virginia Tech) is an Assistant Professor of Chemistry at Central Michigan University (CMU) and an affiliate faculty of the Indiana University Center for Regenerative Biology and Medicine (IUCRBM) at Indianapolis. She did Postdoctoral research in the Department of Polymer Science and Engineering at the University of Massachusetts at Amherst and was later appointed as a Research Associate and a Research Assistant Professor at the IUCRBM. She has published more than 20 papers on well-reputed journals and served as a reviewer for NSF panels, Biomacromolecules, Langmuir, Macromolecular Bioscience, Soft Matter, the Journal of Chemical Physics, etc.

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