

A New Approach to Engineering Advanced Materials

Scientific Achievement

Synthesized surfactant/polymer macromolecules that self-assemble into structures with features below 10 nm

Significance and Impact

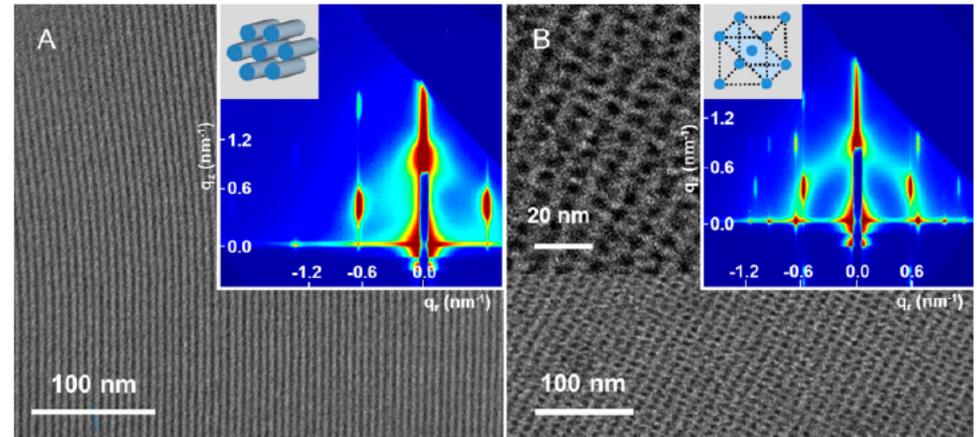
These “giant surfactants” may allow scientists to engineer nanostructures at a size scale vital to continuing advancements in microelectronics

Research Details

- Surfactants are a class of compounds found in many everyday products, from soap to paint.
- Here, small surfactant molecules were “clicked” onto polymer chains to form macromolecules; the resulting functional nanoparticles mimic the structural features of surfactants but are more versatile, allowing the design of new materials with specific properties.
- Grazing incidence small-angle x-ray scattering (GISAXS) at NSLS beamline X9 used to yield information on the shape, size, and orientation of the nanoscale features in thin-film, bulk, and solution samples.
- Data show features smaller than 10 nanometers, a scale critical to advancing microelectronics applications, such as denser, faster computer chips.

Work was performed at Brookhaven National Laboratory

X Yu, K Yue, I-F Hsieh, Y Li, X-H Dong, C Liu, Y Xin, H-F Wang, A-C Shi, G Newkome, R-M Ho, E-Q Chen, W-B Zhang, SZD Cheng, *PNAS* June 18, 2013 vol. 110 no. 25 10078-10083



Transmission electron microscope (TEM) images and GISAXS patterns (insets) of two giant surfactant thin-film samples. The TEM images show ordered nanoscale patterns.