NSLS Study Opens a New Window to Molecular Self-Assembly

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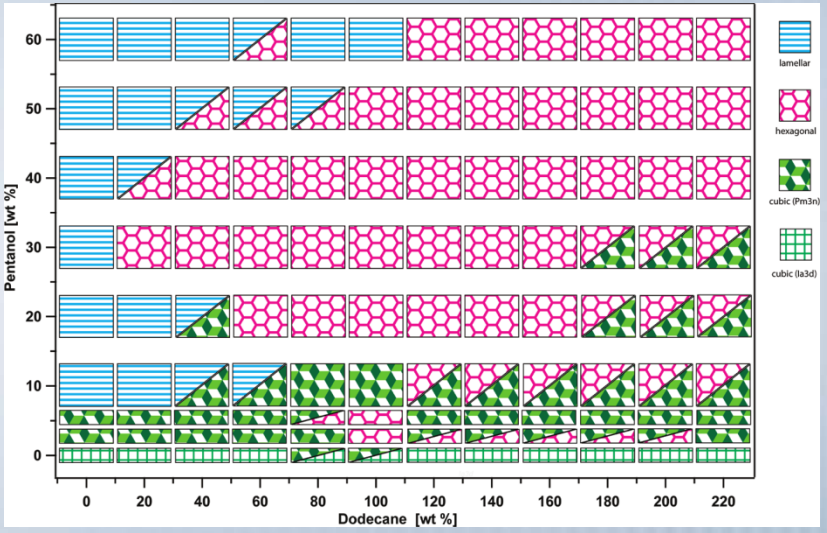
- Understanding the natural phenomenon of self-assembly -- how molecules or other entities gather into ordered objects or arrays -- may allow scientists to manipulate materials at at tiny scales, ultimately yielding great advances in fields such as data storage and pharmaceuticals.
- In efforts to better understand self-assembly, many researchers are studying self-assembling systems in a salt solution, which are known as polyelectrolyte-surfactant complexes (PSCs).
- Using x-rays at NSLS, researchers recently mapped out the full phase diagrams of a new, enhanced type of PSC, determining all the possible shapes and sizes given different solution concentrations. They call their system an electrostatically self-assembled amphiphilic complex, or ESA.
- By adding a substance called pentanol to the mix, and then incorporating large amounts of an oil called dodecane, the researchers caused each phase to nearly double in size.
- The ability is a big step forward in the drive to understand and manipulate self-assembly.



Phase diagram of ESA complexes at 100 mM NaCl salt concentration as a function of pentanol and dodecane content relative to the surfactant weight [wt %].

Stanic et al. "Phase Diagrams of Electrostatically Self-Assembled Amphiplexes" Macromolecules, 44, 7423-7429 (2011).

Work performed on NSLS beamline X6B