



Crosslinkable Gemini Dicarboxylate Surfactant LLCs and Their Membranes

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for efficiently synthesizing crosslinkable Gemini surfactants that adopt bicontinuous cubic phases, including the gyroid phase.

Overview

Aqueous lyotropic liquid crystal (LLC) assemblies are useful for highly selective chemical separations, such as water desalination and selective ion-transporting membranes. LLCs are formed in water when amphiphilic molecules self-organize into soft materials having distinct hydrophilic and hydrophobic nanoscale domains with long-range periodic order. Bicontinuous cubic LLC assemblies are a useful subset because high-symmetry Q-phases, exemplified by the gyroid (G) phase, are ideal for membrane applications given their interpenetrating domains and tunable nanopore diameters.

A class of Gemini ('twin-tail') dicarboxylate surfactants that readily form bicontinuous cubic phases has been developed previously by the researchers. To enable membrane applications of surfactant liquid crystals, these non-covalent assemblies must be chemically fixed in place by crosslinking to form robust materials for separations.

The Invention

UW-Madison researchers have built on their previous work to efficiently synthesize crosslinkable Gemini surfactants that adopt bicontinuous cubic phases, including the gyroid phase. By incorporation of a photoinitiator into the hydrophobic domains of the LLC, the assembly can be crosslinked with retention of the gyroid structure.

Applications

- Development of new selective ion-transporting membranes
- Protective clothing
- Filtration, desalination and water purification
- Exchange membranes for fuel cells
- Lithium ion battery separators

Key Benefits

- New crosslinkable surfactants readily make Q-phases over large concentration and temperature windows.
- Synthesis route is one of the shortest known.
- Materials can be readily crosslinked to make membranes retaining structural order of un-crosslinked phases.

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Additional Information

Related Technologies

- [For more information about high-symmetry, bicontinuous lyotropic liquid crystals, see WARF reference number P120009US01.](#)

Tech Fields

- [Materials & Chemicals : Polymers](#)
- [Materials & Chemicals : Synthesis](#)

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854

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