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Polycontinuous Lyotropic Liquid Crystalline Network Phases from Gemini Dicarboxylate Surfactants MAHESH MAHANTHAPPA, GREGORY SORENSON, ADAM SCHMITT, Department of Chemistry, University of Wisconsin-Madison — Arising from the water concentration-dependent self-assembly of amphiphilic molecules, lyotropic liquid crystals (LLCs) form a wide variety of structurally periodic nanoscale morphologies including discontinuous micellar phases (I), hexagonally-packed cylinders (C), and lamellar (L) phases. In intermediate amphiphile concentration windows between the L and C phases, one typically observes three bicontinuous cubic network phases: gyroid (G), diamond (D), and primitive (P). Recent theoretical work has suggested the possible stability of a variety of non-cubic network phase LLCs, yet none of these phases have been previously observed. In this presentation, we describe the experimental discovery of the first triply periodic network phase LLC with 3D-hexagonal symmetry (space group #193) in binary mixtures of water with a simple gemini dicarboxylate surfactant based on dodecanoic acid. Using a combination of SAXS and rheological methods, we structurally characterize this new phase and show that it is comprised of three interpenetrating lipidic networks of 3-fold connectors in a matrix of water. This finding highlights the unusual aqueous phase behavior of gemini surfactants and suggests new methods for discovering and stabilizing new network phase LLCs beyond the gyroid.

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