109b The Ternary Phase Diagram of a Mixed Cationic / Glycoside Surfactant / Water System and Its Use for Predictive Synthesis of Mesoporous Materials

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Mixed surfactant systems have the potential to impart controlled combinations of functionality and pore structure in mesoporous ceramics. In this instance, we combine a functional glycoside surfactant with a cationic surfactant that more readily forms liquid crystalline mesophases. The phase diagram for the ternary system CTAB/H2O/n-Octylβ-D-glucopyranoside (C_8G_1) at 50°C is investigated using polarized optical microscopy. At this temperature, the binary C_8G_1) /H2O system forms micellar solutions up to over >70 wt% C8G1, and there is no hexagonal phase. With the addition of CTAB, we identify a large area of hexagonal phase, as well as cubic, lamellar and solid surfactant phases. The ternary phase diagram is used to predict the synthesis of thick mesoporous silica films via a direct liquid crystal templating technique. By changing the relative concentrations of mixed surfactants as well as inorganic precursor species, mesoporous silica thick films can be synthesized with variable glycoside content, and with 2D hexagonal, cubic and lamellar structures. The domains over which different mesophases are prepared correspond well with those of the ternary phase diagram if the hydrophilic inorganic species is assumed to act as an equivalent volume of water.