

sions of normal micelle, to cylindrical micelle, to hexagonal phase, to crystalline soap and normal micelle, to lamellar (bilayer) liquid crystals, to inverse micelles, can be related to a series of molecular events that are based on the molecular structures of the surface-active materials involved. Therefore, it is very reasonable that water-alcohol-ionic surfactant systems exhibit similar, but not identical, phase behavior, whereas nonionic surfactant systems will show different behavior, but similar phase progression. These trends become very useful for predicting how surfactants will interact with solvents, even when previous combinations of these components have not been mixed. An empirically derived schematic description of the transition from normal to reversed structures (15) is shown in Figure 1.

### III. FORMULATION OF TOPICAL SURFACTANT ASSOCIATION COLLOIDS

Although brief, the foregoing description of surfactant association colloids does provide the background necessary for a more detailed review of the literature that discusses topical microemulsions and liquid crystals. This section will describe formulations that are suitable for topical use, but that have not been evaluated by percutaneous transport methods to measure release of a particular drug or model compound. Some of these formulations may have been evaluated for parental administration and, thus, could also be considered for use topically. Formulations that have been evaluated using *in vitro* percutaneous transport techniques will be described in Section IV.

#### A. Microemulsions

As stated in the introduction of this chapter, microemulsion vehicles have the potential advantages of both improved stability and solubilization characteristics compared with macroemulsion topicals. These advantages stemmed from the smaller particle size characteristic of microemulsions. It is noteworthy that particles of 1000 Å and smaller are less than one-fourth the wavelength of visible light, resulting in transparent or translucent (opalescent) systems. Although transparency may provide a conceptual appeal to the consumer, it provides other advantages to the formulator. A clear system guarantees mixing has been adequate to solubilize all of the drug or other solid materials in the formulation. Milky white creams typical of macroemulsion-based topicals obscure the presence of undissolved solids. This is particularly important when the drug is a