

mediate destabilizing effect. This base diagram provides insight concerning the surfactant interactions that allow the formation of an alcohol-free microemulsion. The addition of Arlacel 20 (sorbitan laurate) destabilized the structure of the AOT-water lamellar phase. This disordering effect decreases the lamellar region, whereas complementarily increasing the size of the isotropic single-phase region. Thus, for the water-Arlacel 20-AOT base diagram, it appears that Arlacel 20 functions as a cosurfactant similar in mechanism to that of medium-chain alcohols in traditional anionic soap systems. Addition of the cosurfactant destabilizes the bilayer-structured lamellar liquid crystalline phase, resulting in an increase in the compositional range over which the microemulsion is present.

In contrast with the anionic soap systems (11), medium-chain alcohols do not function as cosurfactants when added to the aqueous AOT system. As seen in Figures 4 through 6 (28), the size of the lamellar liquid crystal phase is not reduced to the degree seen upon addition of Arlacel 20. Although the microemulsion region is large when either hexanol or octanol is added as the third component, the most dominant features of these diagrams are the large cubic and inverse hexagonal liquid crystalline regions. The stability of these stiff phases shape the boundaries of the microemulsion region. The water-butanol-AOT diagram shown in Figure 4 is characterized by a continuous solubility region between the butanol and water corners. This phase behavior is typical for butanol systems, and the resulting fluid bicontinuous phase is speculated to be less likely to have the desired ability to solubilize both lipophilic and hydrophilic drugs.

The maximum water solubilization obtainable for three Arlacel 20/AOT ratios in hexadecane is shown in Figure 7. The 73:27 Arlacel 20/AOT surfactant ratio that gave maximum water solubilization for the base diagram (see Fig. 3) did not give maximum water solubilization after addition of more than 20% hexadecane. Similarly, the 85:15 Arlacel 20/AOT surfactant ratio had limited ability to solubilize water. However, increasing the amount of AOT to a 60:40 Arlacel 20/AOT surfactant ratio provided a large isotropic region capable of solubilizing more than 60% water. More importantly, this system was able to solubilize significantly more water at higher hexadecane concentrations than the systems with larger Arlacel 20/surfactant ratios. Thus, addition of hexadecane to the AOT-Arlacel 20 system provides for a systematic characterization of the alcohol-free microemulsion. As seen in Figure 7, the surfactant ratio has a significant influence on the water solubilization capacity of the system. If high water solubilization over a range of mixed surfactant/oil ratios is required, then the Arlacel 20/AOT ratio should be less than 73:27 (i.e., the surfactant ratio that results in the maximum water solubility in the base diagram; see Fig. 3).