Biocompatible microemulsions of dicephalic aldonamide-type surfactants: formulation, structure and temperature influence.

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Rok wydania

2009

Czasopismo

Journal of Colloid and Interface Science

Numer woluminu

334

Strony

87-95

DOI

10.1016/j.jcis.2009.03.071

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

The temperature effects upon microemulsion systems composed of dicephalic N-dodecyl-N,N-bis[(3-D-aldonylamido)propyl]amines C12-DX (gluconyl GA or lactobionyl LA)/iso-butanol/hydrophilic (diethylene glycol monoethyl ether) or hydrophobic (iso-octane) oils/water were investigated by evaluating isotropic area magnitudes in the pseudoternary phase diagrams, as well as droplet characteristics by electron paramagnetic resonance (EPR) and dynamic light scattering (DLS) spectroscopies at 25, 40 and 55 degrees C. We concluded that in the examined systems a cosurfactant, such as middle-chain alcohol, was needed to obtain large mesophase isotropic areas. The phase behavior and structure of the examined systems were temperature insensitive but they were intimately determined by the nature of the C12-DX and the polarity of the oil phase. By adjusting the nature of the oil, as well as the surfactant hydrophilicity, the performed isotropic systems containing low amounts of nonaggressive surfactant could be formulated successfully. Interfacial properties and the dynamic structure of the surfactant/cosurfactant monolayer were studied by the spin probe technique using the 16-doxylstearic acid methyl ester (16-DSE) as the appropriate probe. The polarity of the interface was not affected by temperature but the interface rigidity was dependent upon the nature of the surfactant and oil as well as on temperature. The size of the dispersed domains, evaluated by dynamic light scattering (DLS), was found to be a function of temperature, surfactant content and type of additives. The investigated o/w microemulsions (i.e., ranging from 3.0 to 8.8 nm) constituted promising templates for a variety of syntheses of nanostructures with small size and high-capacity solubilizing media.