Deuterium NMR and Raman Spectroscopic Studies on Conformational Behavior of Lipophilic Chains in the $C_{12}E_3$ / Decane / Water System

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Z. Naturforsch. **57 a,** 320–326 (2002); received March 2, 2002

Presented at the XVIth International Symposium on Nuclear Quadrupole Interactions, Hiroshima, Japan, September 9-14, 2001.

The order parameter and the conformations of the lipophilic chains in the $C_{12}E_3$ / decane / water ternary system have been studied by deuterium NMR and C-D stretching Raman spectroscopy. The order parameter and the trans fraction of the C-C bond of decane molecules decrease steadily or remain nearly constant with increasing decane concentration without noticeable changes at the phase transitions. On addition of decane molecules to the $C_{12}E_3$ / water system, the effective volume of the lipophilic part of a single surfactant molecule increases as a result of the penetration of the added decane molecules into the lipophilic layer, leading to a high mobility of the alkyl chain. To minimize the resulting increase in the effective cross-sectional area of a surfactant molecule, the molecular chains of the surfactant reorient remarkably in the concentration region near the phase transitions, and the shape of the self-organizing structure changes to the one with a larger packing parameter.

Key words: $C_{12}E_3$ / Decane / Water System; Conformational Behavior; Phase Transition; Deuterium NMR Spectroscopy; Raman Spectroscopy.