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Surfactant and liquid crystalline behavior of 4-chloro-3,5-dimethylphenyl 2, 3, 4, 6-tetra-O-acetyl-α-D-glucopyranoside

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Glycolipids are natural surfactants based on a hydrophilic sugar (carbohydrate) part and a hydrophobic hydrocarbon domain. The target of our research is the rationalization of the surfactant behavior of a novel glycolipid on the basis of the critical micelle concentration (CMC) including the chemical synthesis and phase analysis.

The nonionic surfactants treated with iodine form donor –acceptor complexes in aqueous medium. Thus the CMC is determined by the spectral absorption and the shift in the absorbance maximum (λ_{max}) of I_2 upon complexation with surfactant. The CMC of the novel compound is comparable with that of Triton X-45. The interest in the study of liquid crystalline behavior of new amphiphilic carbohydrate derived liquid crystals stems from the fact that carbohydrates can be substituted with alkyl or aryl chains relatively easily. The most important step is the formation of the glycosidic bond. Thus the present work describes the direct coupling of penta-O-acetyl-α-D-glucose to chloroxylenol (4-chloro-3, 5-dimethylphenol) by using borontrifluoride etherate as the catalyst at room temperature. The structure of 4-chloro-3,5-dimethylphenyl 2, 3, 4, 6-tetra-O-acetyl-α-D-glucopyranoside was elucidated by means of ^{1}H and ^{13}C Nuclear magnetic resonance spectroscopy, Fourier transform infrared spectroscopy and Gas chromatography-mass spectroscopy. The anisotropic shape of the molecules is important to exhibit liquid crystallinity. In the nematic liquid crystal phase, anisotropically shaped molecules conserve a part of the orientational order and adopt a parallel orientation, after melting. The study of thermotropic liquid crystal behavior of the product was carried out using optical polarized light microscopy, differential scanning calorimetry, and thermo microscopy. Further the nematic phase of the product was confirmed by X-ray diffractometry.

Key words: Glycolipids, surfactants, liquid crystals, critical micelle concentration.

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