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Langmuir monolayer of alkyl polyglycosides (AP) having different alkyl chain length and degree of polymerization was studied. 5 M NaCl aqueous solution is enough to prepare the insoluble monolayers of some series of APs.

Keywords: alkyl polyglycoside; monolayer; sodium chloride; Brewster angle microscopy

INTRODUCTION

Insoluble monolayer has drawn researcher's interests in the fields of dispersed systems, optical devices, information storage, etc. Insoluble monolayer of water-soluble molecules has been prepared using a concentrated inorganic salts solution such as NaCl or $NaNO_3$[1-3]. Alkyl polyglycoside (AP) has different properties compared to the classical ethoxylated non-ionics[4]. Its chemical structure is shown in Fig. 1.

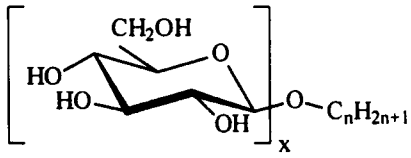

FIGURE 1 Chemical structure of alkyl polyglycoside. X is degree of polymerization, n alkyl chain length

In this study, the water-insoluble Langmuir monolayer of APs was prepared by introducing concentrated salt solutions and investigated for various kind of APs.

EXPERIMENTAL

N-β-D-hexadecyl maltoside (16G2), n-β-D-tetradecyl maltoside (14G2), n-β-D-dodecyl maltoside (12G2), n-β-D-dodecyl glucoside (12G1), n-β-D-decyl glucoside (10G1), n-β-D-octyl glucoside (8G1), and n-α-D-decyl glucoside (α-10G1) were obtained from Sigma Co. at a purity of higher than 98%. APs were dissolved in chloroform or dimethylacetamide at a concentration range of 10^{-4} to 10^{-3} M depending on each APs and spreading volumes. The sample solution was dropped onto the subphase containing 5 M NaCl at 25 ± 0.5℃. After 30 min, compression was performed using a continuous speed for the barrier of 10 mm·min^{-1}, whereas the trough area is 510 mm × 150 mm. π-A isotherms were measured on a computer controlled Langmuir film balance (KSV 3000, KSV Instrument Ltd.). BAM (NL-EMM633-KS,

Nippon Laser & Electronics Lab.) on a trough system (NL-LB240S-MWC) was used to observe the surface morphology. Details of the BAM and its experimental setup were described elsewhere[5].

RESULTS AND DISCUSSION

As shown in Fig. 1 (a), degree of polymerization as well as alkyl chain length of AP does not strongly affect the shape of the overall π -A isotherm for 16G2, 14G2, 12G2 and 12G1. Area per molecule of 12G1 at collapsing is about 0.5 nm2, which is comparable to the molecular area resulted from surface tension method[6].

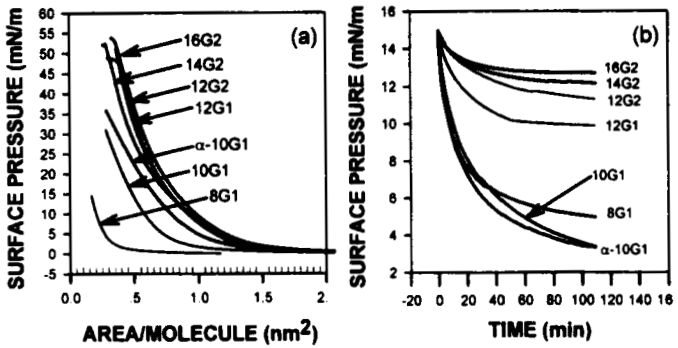

FIGURE 2 Langmuir monolayer study; (a) π -A isotherm, (b) film stability of APs.

α-10G1 was used to study anomeric effect on the monolayer structure. The axial orientation with respect to the polar head of α

anomer is the reason for the more expanded π -A isotherm. Their stability was also investigated by measuring surface pressure at constant area as a function of time after the monolayer has been spread. Fig. 2 (b) shows monolayers of 10G1, 8G1 and α-10G1 are unstable even in a concentrated salt solution. BAM images of AP monolayers are shown in Fig. 3. The dimensions of these images are approximately 0.65 mm × 0.90 mm. The monolayer picture is not very clear since the reflectivity difference is small due to the dissolution of the large amount of salts in subphase. Small bright spots appeared randomly and their brightness became much higher as the compression goes.

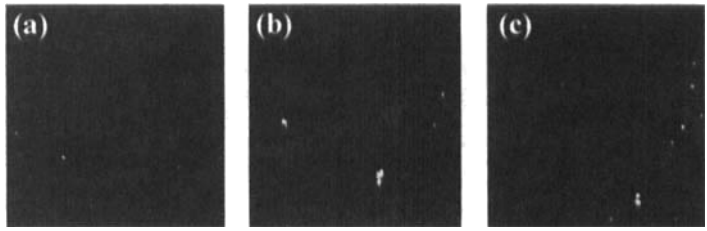

FIGURE 3 BAM picture of 12G1 in 5 M NaCl aqueous solution; (a) 0.0 mN/m, (b) 23.0 mN/m, (c) 36.3 mN/m

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