FABRICATION OF LANGMUIR-BLODGETT FILMS INCORPORATING A BANANA-SHAPED MOLECULE

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Bent-core or banana-shaped molecules are an active field of research in liquid crystals since the pioneering results by Niori et al[1]. These molecules adopt a compact packing arrangement that restricts rotational freedom, thus allowing the molecules to organise into novel types of liquid crystalline phases with noticeable electro-optical responses, ferro- or antiferroelelectric behaviour and high polarization values[2]. In this work we have used the Langmuir-Blodgett technique to study a bent-core molecule (see Figure 1) which presents a tilted lamellar polar phase in the bulk. We show that the LB technique is a useful procedure to fabricate well-ordered films of bent-core molecules and also can give insight into their molecular packing[3].
Stable Langmuir films have been prepared and characterized onto an aqueous basic subphase (pH = 9). Monolayer phase transitions have been investigated using surface pressure-area (π-A) and surface potential-area (ΔV-A) isotherms and BAM images, showing that solid phase is achieved at π = 20 mN/m. UV-vis reflection experiments have shown that molecules are tilted up during compression, reaching a compact packing in the condensed phase. Langmuir films have been transferred onto solid substrates at π = 25 mN/m, resulting in formation of noncentrosymmetric LB layers (Z type transference).
UV-vis spectra of the LB films confirm a constant transfer ratio during the LB fabrication. Moreover, one-layer LB films deposited onto Si (100) have been investigated using the XRR technique; the fitting of experimental data indicates that the monolayer has a height of 5.8 nm. This result shows that molecular orientation in the LB films is almost similar to the air-water interface.

References

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Figures:

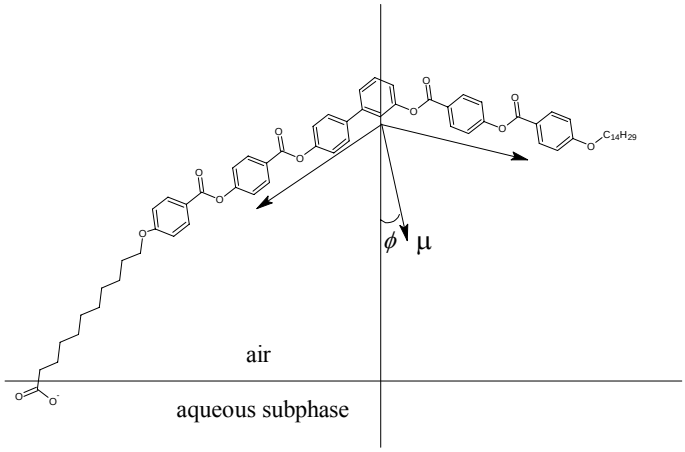

Figure 1: Chemical structure and molecular orientation at the air-water interface

of the banana-shaped molecule.

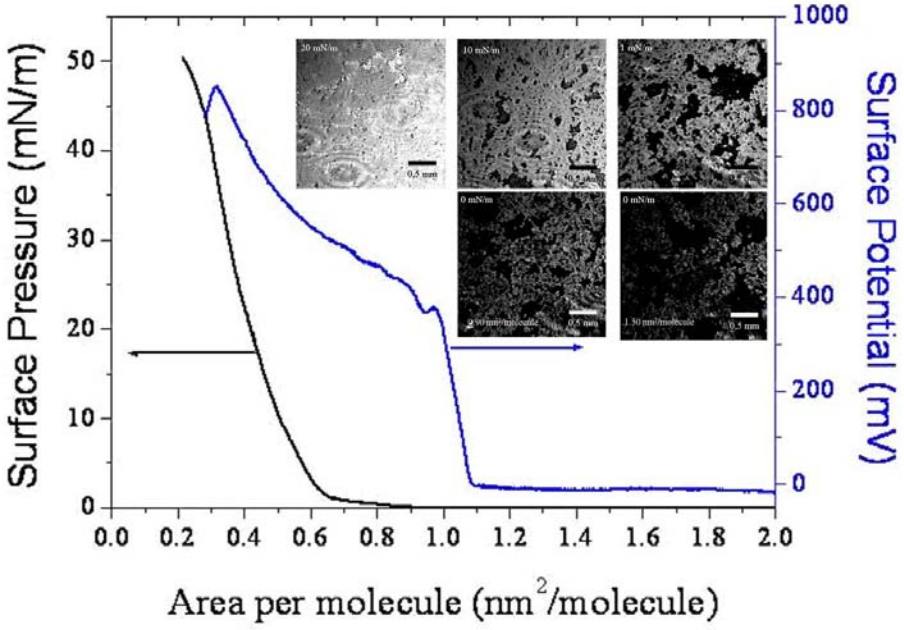

Figure 2: π-A and ΔV-A isotherms and BAM images obtained during compression.

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