

EFFECT OF SUBSTRATE ON THE MOLECULAR ARRANGEMENT IN Cd-ARACHIDATE MULTILAYERS - AN X-RAY STUDY

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ABSTRACT

The molecular organization in fatty acids and salts as a function of process variables has been studied extensively. However the effect of substrates on the evolution of molecular order is still not completely understood. Hence in the present work the structure of Cd-arachidate multilayers prepared under identical conditions on two different substrates, glass and silicon, is studied by grazing incidence x-ray reflection/diffraction.

The grazing incidence reflectivity studies indicate the formation of a well ordered layered structure on both the substrates. The bilayer spacing is found to be 5.53 nm in the case of glass substrate compared to 5.44 nm in the case of Si substrate, indicating a tilted molecular arrangement on the Si substrate. The interface morphology was studied by longitudinal offset scans and transverse scans and is found to be significantly different in the two cases. The interface morphology is found to be highly correlated along the growth direction, independent of the substrate. The lateral interface morphology in the case of multilayers made on glass substrate indicate a self-affine behavior with no cut-off for the lateral correlation length while those made on the Si substrate exhibit a finite correlation length. The in-plane molecular order in the two cases is also very different. The molecules on the glass substrate exhibit a highly ordered 'Orthorhombic' arrangement whereas they have a disordered structure on the Si substrate. The unit cell parameters for the multilayers on glass substrate are, $a = 0.486$ nm and $b = 0.746$ nm, in agreement with the bulk values.

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