4.3 Phase Seggregation and Intermixing of Mixed DCANP/CdA Langmuir-Blodgett Films Measured by Atomic Force Microscopy

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Mixed and pure Langmuir films of 2-docosylamino-5-nitropyridine (DCANP) LB molecules and arachidic acid (AA) have been inspected with scanning force microscopy (SFM) with respect to their structural properties. Our measurements on both the monolayer LB films transferred to mica, and bilayer arrangements on pyrex and Si showed continuous phases as long as dilution concentration with AA was kept below 30%. The surface root-mean square (rms) roughness of these films was better than 0.1 nm measured over 1 μm^2 surface area indicating that the molecules are very well stacked. Because neither of the two phases was found to aggregate in isolated domains (for 0%, 20% and 30% dilutions) this LB film can be regarded as a homogeneous phase of the AA/DCANP mixture. Also the measured unit cell shows a triclinic structure. From the projective view of SFM no differences between AA and DCANP molecules could be determined either on the atomic nor on the mesoscopic scale. Also the measured film height corresponds well with the pure DCANP film thickness.

SFM investigations on mixed LB films containing more than 30% AA showed a pronounced phase separation into the two components. The mixed film thus no longer behaves like a continuous phase but decomposes into island shaped aggregates of the AA phase within the DCANP matrix. When investigating these mixed LB films transferred from a water subphase which contains Cd^{2+} ions (to adjust pH), the AA phases were found to stack in the bilayer configuration due to the strong interaction between Cd^{2+} ions and the AA headgroups.