ESRF	**Experiment title:** Phase diagrams of chiral alcohol monolayers using grazing incidence diffraction	**Experiment number:** SC518
Beamline: ID10B	**Date of experiment:** from: 28/10/98 to: 02/11/98	**Date of report:** 10/02/99
Shifts: 15	**Local contact(s):** SMILGIES Detlef	*Received at ESRF:* 01 MAR. 1999

Names and affiliations of applicants (* indicates experimentalists):
Anne RENAULT (*)
Coralie ALONSO (*)
Franck ARTZNER (*)

Report:

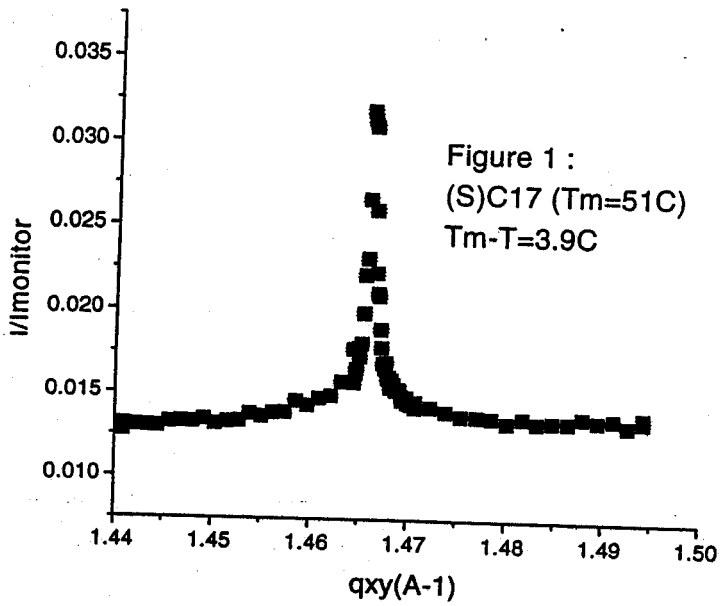
We are interested in studying the role of the chiral polar head on the two -dimensional organization of monolayers of simple molecules, 2-alcohols with short chains (between 12 and 17 carbons). The way to understand the influence of chirality on stacking is to established phase diagrams (melting temperature versus concentration of an enantiomer to the other). We have done that by ellipsometry and surface tension measurements for 2C13 and 2C14 : we didn't observe clear effect of chirality. All mixtures exhibit the same behavior which is significant of a solid solution.

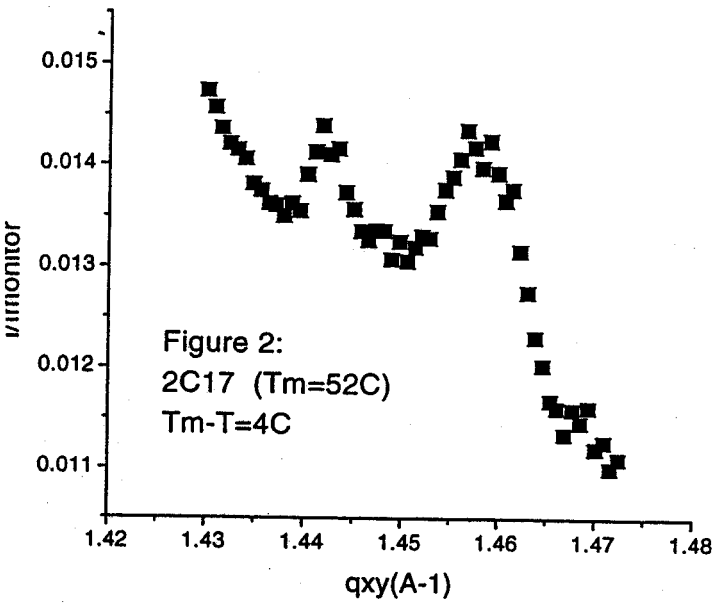
We also performed grazing incidence diffraction experiments to confirm this hypothesis. For 2C13, monolayers of different proportions of both enantiomers exhibit just one single phase, stable with time and with temperature : molecules are arranged on a hexagonal lattice with a large coherence length, and all lattice parameters are different. This is consistent with a solid solution. Another effect of chirality is more obvious close to the melting of monolayers. For racemic mixture and pure enantiomer, the melting of monolayers is sudden whereas it is more continuous for intermediary mixtures. It can be compare to three-dimensional phase transition which are smoothed by the presence of impurities : the excess of one enantiomer can be considered as an impurity. These encouraging results drove us to the study longer chain lengths to

determine if it is possible to hide the chiral effects increasing the number of carbons.

This experiment was dedicated to 2C16 and 2C17, racemic mixtures and pure enantiomers. The ellipsometric and surface tension measurements show that the chirality does not affect the melting temperature of monolayers. The difference between racemic and pure enantiomer does not exceed 1C. For both compounds of 2C16 results are the same as for shorter chains : hexagonal phase for any temperature and no particular effect before the melting of the monolayer. The lattice parameters are close to each other but not egal and the coherence lengths are comparable (~ 10000A). These first results seem to show that the mixture of enantiomers is a solid solution.

Results are more surprising for 2C17. The pure enantiomer exhibit a hexagonal phase for any temperature (see figure 1). Whereas for racemic mixture the hexagonal arrangement of molecules is only stable at low temperature (<45C, Tm=51C). For higher temperatures we observed a splitting and a broadening of the peak significant of a rectangular phase (see figure2). The vertical distribution of intensity showed also a tilt of molecules. This solid-solid phase transition was not detected by ellipsometry measurements thus we need to perform complementary diffraction experiments to explain this phenomena.





In order to understand what occurs at the molecular level when both enantiomers are mixed, it is necessary to explore the whole phase diagram. This would be the aim of our next experiment.