ESRF	**Experiment title:** Phase diagram of chiral alcohol monolayers using grazing incidence diffraction	**Experiment number:** SC560
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Report:

Our study concern monolayers of simple chiral molecules (2-alcohol) at the air/water interface. We want to understand the role of the chiral polar head on the two-dimensional organization comparing our results with analogous obtained with non-chiral molecules. We have already studied short chain alcohols (less than 15 carbons) and obtained very interesting results. Now, our goal is a little bit different : we want to compare the two- and three-dimensional stacking of these molecules, thus we are more interested in monolayers of longer chains (16 and 17 carbons) because 3D compounds are solid at room temperature which make easier the study of 3D components. During a precedent experiment we began to study monolayers of 2C16 and 2C17. We observed surprising phenomena for 2C17 thus this experiment was dedicated to this particular compound. We investigated the whole phase diagram varying the proportion of one enantiomer to the other. For each mixture the monolayer was deposited in its liquid phase then temperature is decreased for 10K. The experiment consists in following the evolution of the crystalline phase upon heating until the melting of the monolayer. The results for the different mixtures are the following :

- for the pure enantiomer ((S)C17) we observed just a single phase which is a

hexagonal one. No pre-transitional effects were detected close to the melting.

- 90% of (S)C17 : the hexagonal phase is stable but we observed a broadening of the diffraction peak few degrees below the melting. This is the same result as for shorter chains (2C13)

For other mixtures results are rather different.

- 50% of (S)C17: we observed a solid-solid phase transition when temperature reached 45C. For lower temperatures, the monolayer exhibit a hexagonal phase and for higher ones a rectangular phase with tilted molecules which remained stable until the melting (see figure 1 for the evolution of crystalline phase)
- 75% of (S)C17: same result as racemic mixture but the temperature of the solid-solid transition is shifted to 47C.
- 60% of (S)C17: there is also a transition close to 46C but the splitting of the peak is not so obvious than for the other mixtures, in fact it looks like a melting.

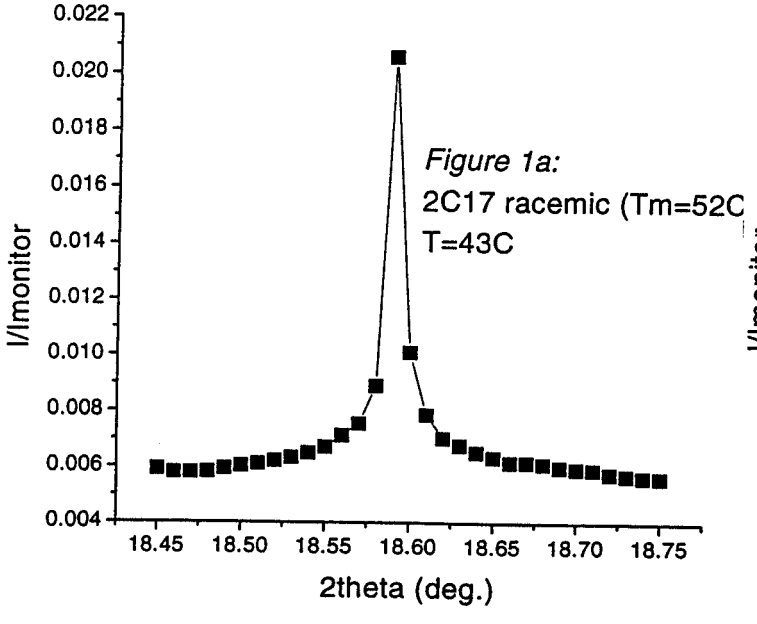

Figure 1a:
2C17 racemic (Tm=52C
T=43C

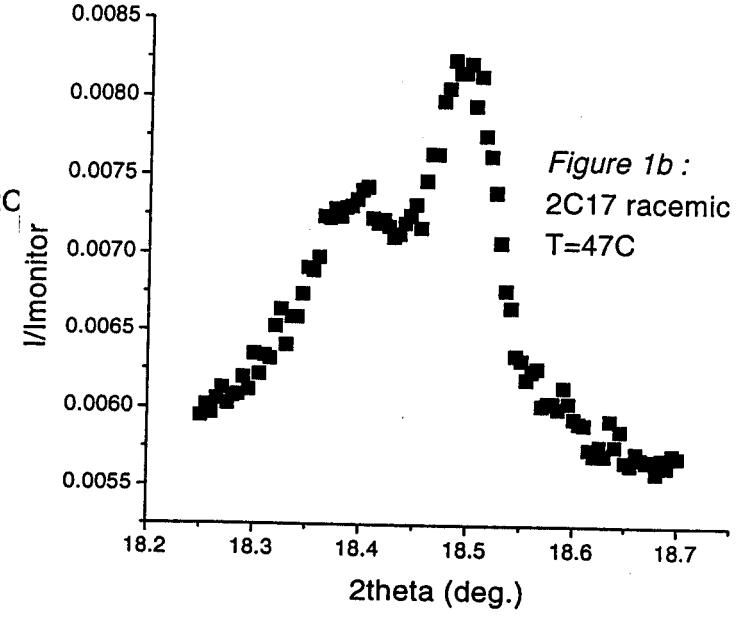

Figure 1b :
2C17 racemic
T=47C

These results are very encouraging. The chiral polar head may strongly affect the two-dimensional organization even for long chains. In this kind of systems, the stacking is not only controlled by the aliphatic chains. The same result is valuable for three-dimensional compounds. But the crystalline phases are not affected in the same way. The study of monolayers need more experiment to well understand what occurs at the molecular level during this transition. And we have also to investigate the phase diagram of 2C16 to determine if the behavior of 2C17 is particular or if it is a critical number of carbons which separate long chains from shorter ones.