

## Locating chiral molecules added to a nematic lyotropic liquid crystal using ALC- $\mu$ SR

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Lyotropic liquid crystals (LLCs) are formed by aqueous solutions of amphiphilic molecules. In the so called nematic LLC phase the amphiphiles aggregate into e.g. disc-shaped micelles which align with their  $C_\infty$  symmetry axes along a preferred direction, known as the director. The addition of chiral molecules (“dopants”) to a non-chiral nematic phase induces a macroscopic helical modulation of the director field with the so called pitch  $p$  as spatial period. The origin of this unique effect in nematic LLCs is a matter of continuous discussion, a crucial question being the actual location of the chiral dopant: within the apolar micelle core or in the polar surrounding water [1]. The ALC- $\mu$ SR technique is a highly promising approach to solve this crucial question since it has already been very successfully applied to investigate the partitioning of probe molecules between polar and apolar environments in LLCs [2].

We report the first ALC- $\mu$ SR investigation locating a chiral dopant in a nematic LLC host phase. Fig. 1 shows the ALC- $\mu$ SR spectra of (*R*)-mandelic acid (*R*-MA) in water and in the nematic LLC phase formed by cetyldimethylammonium bromide (CDEA), decanol (DOH) and water. *R*-MA in water shows three  $\Delta_0$ -resonances belonging to the radicals formed by adding  $\mu$  to the phenyl ring in ortho-, para- or meta-positions. In the case of the chirally doped LLC phase the  $\Delta_0$ -resonances are partly shifted to lower field, and an additional very broad  $\Delta_1$ -resonance appears. Both phenomena strongly indicate that the dopant is partly located within the micelles of the LLC [2]. The influence of dopant concentration and of temperature was investigated and is discussed with respect to the helical pitch of the chiral nematic LLCs measured by polarizing optical microscopy.

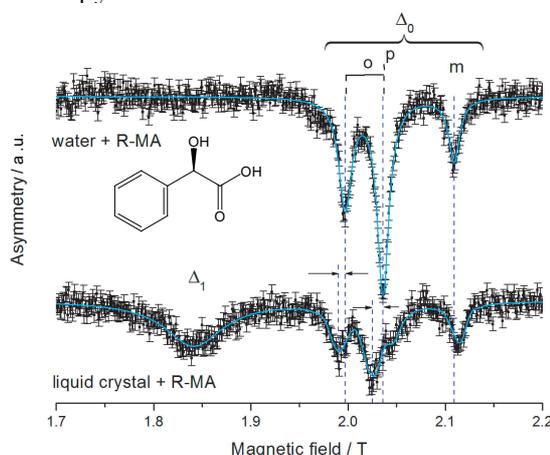


Fig.1 Chemical structure of (*R*)-mandelic acid and the ALC- $\mu$ SR spectra of *R*-MA in water (top) and of *R*-MA added to the nematic LLC phase of CDEA / H<sub>2</sub>O / DOH with the composition (mass fractions) 0.283 / 0.674 / 0.043 (bottom) at 285 K. The arrows indicate the shift of the resonances between the two samples.

[1] M. Pape, and K. Hiltrop, Mol. Cryst. Liq. Cryst. 307 (1997) 155.

[2] A. Martyniak et al., Phys. Chem. Chem. Phys. 8 (2006) 4723.