Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.


## Supporting Information

# Homeotropic orientation of ion-channel forming mesophase induced by nanotemplate wetting

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I. The surface morphology of PTFE-rubbed substrates was investigated with Atomic Force microscopy using a Multimode instrument coupled to a NanoScope IV controller from (Bruker). To this end, a layer of a model main-chain liquid crystal, poly(dipropyl siloxane) (PDPS), was deposited by spin-coating on a PTFE-rubbed Si substrate.[1] Figure S1 shows the characteristic AFM height image where the direction of the aligned PDPS lamellae revealing the orientation of the underlying PTFE layer.[1]

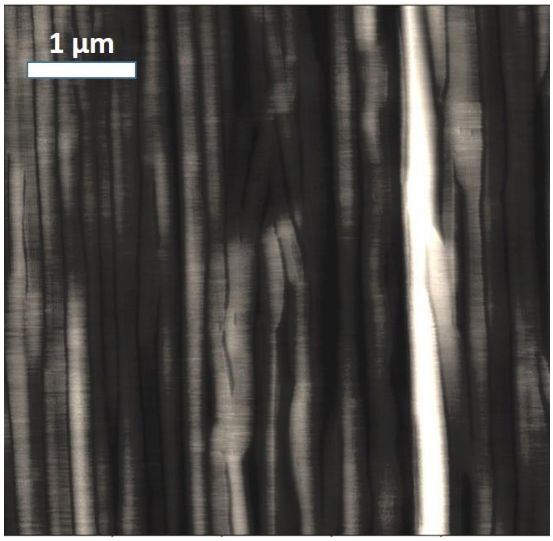


**Figure S1**. Height AFM image of poly(dipropyl siloxane) deposited on a PTFE-rubbed Si substrate. The orientation of PDPS lamellae reveal the quality of alignment of the underlying PTFE-rubbed Si substrate.

II. The effect of thermal treatment on **A-Na** thin films prepared with different thickness was evaluated as follows. To perform thermal annealing process, the samples were kept at 75ºC for 30 minutes, well above the isotropization temperature of the mesophase. The liquid crystalline phase was formed upon cooling of the samples to 30ºC. No changes in liquid crystalline phase or sample morphology and orientation compared to the fresh samples shown in the main text are detected after the annealing, as can be observed in figure S2.

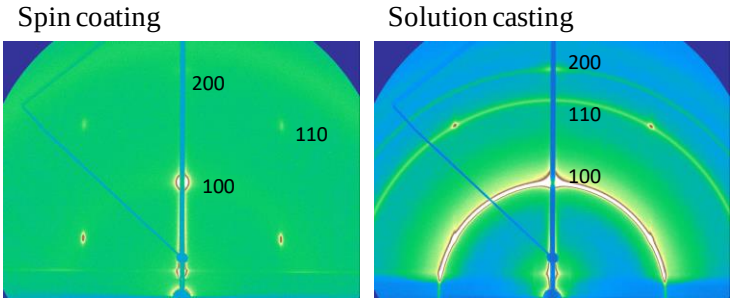


**Figure S2**. 2D GISAXS patterns measured on A-Na films with different thicknesses (several tens of nm - left and several hundreds of nm - right) prepared over Si substrates.

III. The Herman´s function ($f_2$) was employed for evaluation of the orientation of the supramolecular columnar structure formed by the **A-Na** sulphonate. The function is defined as:

$$f_2 = \frac{3\langle cos^2\varphi\rangle - 1}{2} \qquad \text{Eq. (1)}$$

where

$$\langle cos^2\varphi\rangle = \frac{\int_0^{\pi} I_i sin\varphi_i cos^2\varphi_i d\varphi}{\int_0^{\pi} I_i sin\varphi_i d\varphi} \qquad \text{Eq. (2)}$$

In Eqs. (1-2), $\varphi$ corresponds to the angle between columnar axis of the mesophase and the axis of the pore. To evaluate $\varphi$ from the azimuthal position of 100 reflection of the hexagonal phase the $\langle cos^2\varphi_{100}\rangle$ has to be calculated.

In the next step, the relationship between $\langle cos^2\varphi\rangle$ and $\langle cos^2\varphi_{100}\rangle$ can be written as [2]:

$$\langle cos^2\varphi\rangle = 1\text{-}2\langle cos^2\varphi_{100}\rangle \qquad \text{Eq. (3)}$$

The angular references and *s*-range used to obtain the azimuthal intensity profiles for the calculation of the orientation function are depicted schematically in figure S3a. Prior to the calculation of $f_2$, the background corrected scattering curves were normalized. The intensity profiles obtained at different distances from the AAO template/A-Na film interface are shown in figure S3b.

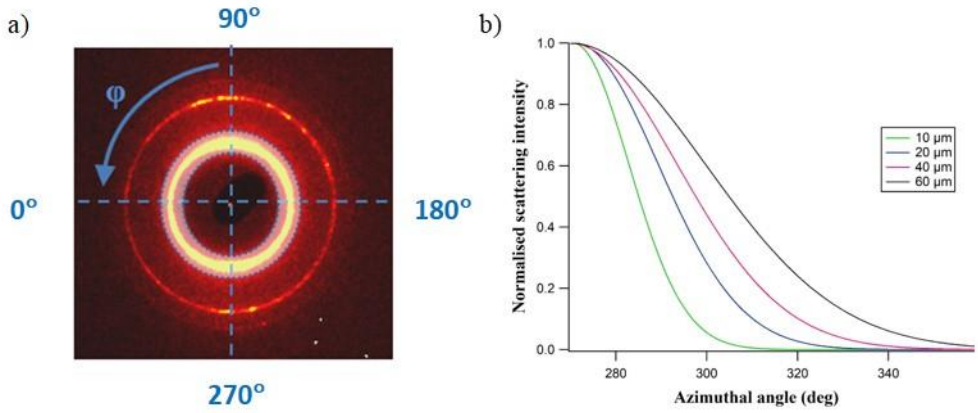


**Figure S3**. (a) Scheme of reference angles and region corresponding to the 100 reflection of the $Col_{hd}$ phase (shadowed using white ring) used for the calculation of the Herman´s orientation function.(b) Azimuthal intensity profiles obtained at different distances from the AAO template/A-Na film interface after background subtraction and normalization procedure.

## References


1 Y. Odarchenko, M. Defaux, M. Rosenthal, A. Akhkiamova, P. Bovsunovskaya, A. Melnikov, A. Rodygin, A. Rychkov, K. Gerasimov, D.V. Anokhin, X. Zhu, D.A. Ivanov, One Methylene Group in the Side Chain Can Alter by 90 Degrees the Orientation of a Main-Chain Liquid Crystal on a Unidirectional Substrate, *ACS Macro Lett*. 2018, **7**, 453−458.

2 Z.W. Wilchinsky, Determination of Orientation of the Crystalline and Amorphous Phases in Polyethylene by X-Ray Diffraction, *Journal of Polymer Science: Part A-2* 1968, **6**, 281-288.