Visible fingerprints of symmetry, topology and defects of lyotropic liquid crystals

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Abstract

Optical microscopy is a powerful tool in studies of liquid crystals because the symmetry, topology and characteristic defects of mesophases create some visible fingerprints. Known usually as *textures* (mostly of thermotropic phases) many of them have been collected in beautiful books such as, for example, the one of Demus and Richter [1].

Here, we will focus on fingerprints of lyotropic liquid crystals, often visible on interfaces that are ubiquitous in these organised solutions. We will deal mostly with interfaces between cubic and isotropic phases. Let us emphasize that the variety of such interfaces is large because several cubic phases with different symmetries and/or topologies can coexist with four isotropic phases (vapor and three liquid phases).

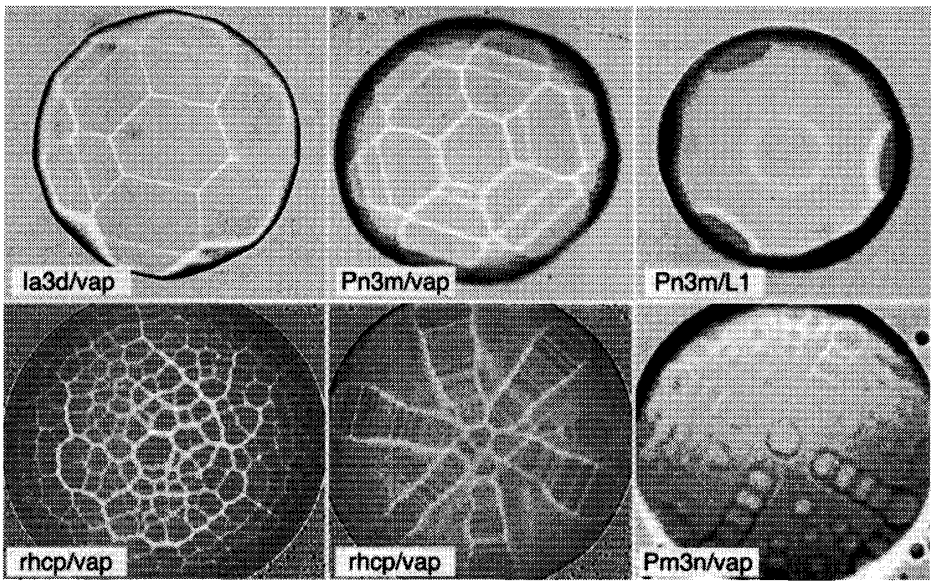

Figure 1: Examples of facetted interfaces in lyotropic systems.

In the first part of the talk, we will review and discuss observations of facetted shapes of such interfaces by means of the isoplethal and hygroscopic techniques [2]. Thanks to the

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selection rules for occurrence of facets, similar to the extinction rules for Bragg reflections in X-ray crystallography [3], symmetry of cubic phases can be inferred from constellations of facets (see Fig.1). Among others, faceting of bicontinuous phases with broken symmetries [4] and of close packed micellar phases [5] will be discussed.

In the second part of the talk we will report on recent observations of steps (see Fig.2), forming closed loops or connected to dislocations, occurring at cubic/isotropic interfaces [6].

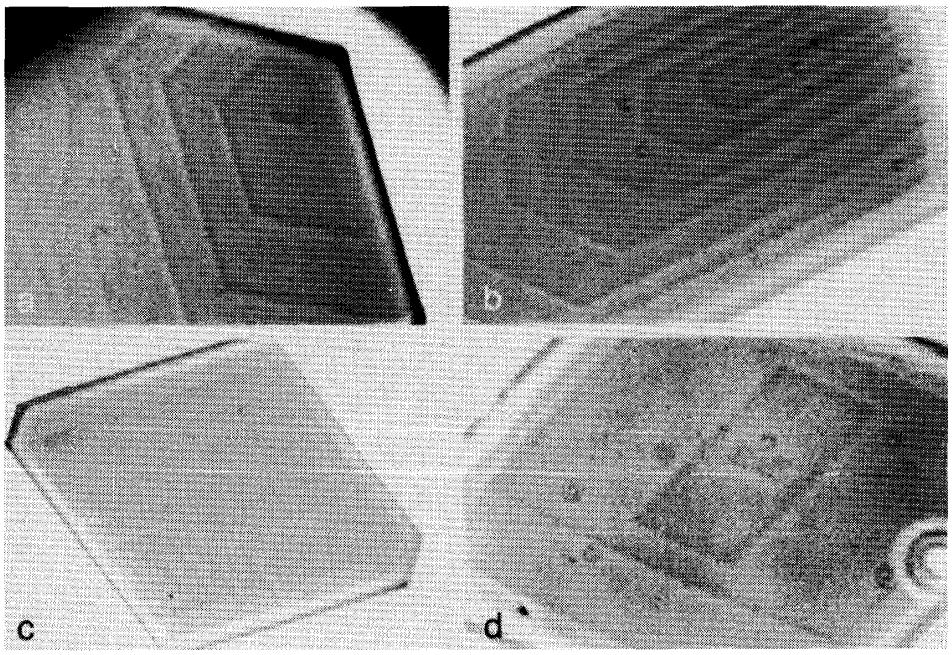

Figure 2: Steps on (112) and (220) facets of a Ia3d/vapor interface.

References

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[6] S. Leroy and P. Pieranski, to appear in J. Phys.: Condens. Matter