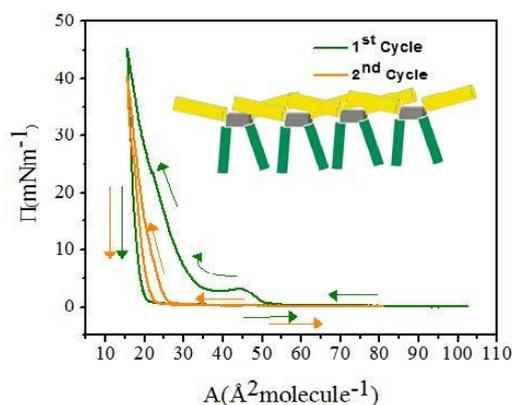
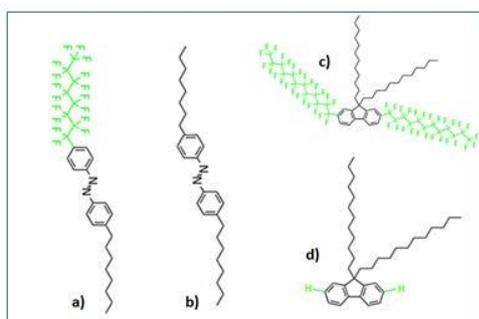


Structure of photo-responsive semifluorinated alkanes at the water-air interface

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The structural properties of semifluorinated alkanes (SFA) at the water-air interface have received attention over the last years because of their ability to form stable Langmuir monolayers at the air-water despite the hydrophobicity of both constituents. This allows tailoring film properties for specific applications. In the present study we investigate the effects of molecular architecture and external stimuli on the interfacial properties of a novel series of architecturally complex semifluorinated alkanes. They include a T-shaped fluorene derivative with four side chains (FL(HH12)9(FF12)2,7) and an analogous without fluorinated side chains (FL(HH12)9(HH2)2,7) (figure 1). A systematic investigation of structure formation in response to light stimulus has been performed for semifluorinated azobenzene derivatives (F8-azobenzene-H8 and H8-azobenzene-H8) at the water-air interface and after transfer to the silicon wafers.



Left panel: Chemical structure of SFAs a) F8-azobenzene-H8, b) H8-azobenzene-H8, c) FL(HH12)9(FF12)2,7 and d) FL(HH12)9(HH2)2,7 Right panel: Surface pressure isotherm of FL(HH12)9(FF12)2,7 and the proposed molecular packing from neutron reflectivity analysis at the water-air interface

We apply the methodology developed recently to study the two-dimensional packing behavior of semifluorinated alkanes with varying architecture e.g., with a central C-C bond in the molecule, F12H12 [1] [2]. We study the hierarchical self-assembly by means of neutron reflectivity, pressure isotherms and compression-expansion cycles using a Langmuir trough. We find that the UV irradiation influence dramatically the packing behavior of the azobenzene molecules leading from vertically oriented structures to mixed configurations with any signature of phase transition. We show that the fluorinated T-shaped molecules form layers undergoing a phase transition ($\Pi=3\text{mN/m}$ -see figure) and irreversible compression-expansion deformation. On the other hand, for hydrogenated molecules with the same structure, a reversible layer deformation without any phase transition is detected. Packing models of both systems are proposed thanks to the analysis of neutron reflectivity spectra.

- [1] de Viguier L., Keller R., Jonas J., Berger R., Clark C., Klein C., Geue T., Muller K., Butt H.J., Vlassopoulos D., *Langmuir* 27 (2011) 8776
- [2] Klein C., de Viguier L., Christopoulou C., Jonas J., Clark C., Muller K., Vlassopoulos D., *Soft Matter* 7 (2011) 7737