

## セミナーのご案内

講師 : Prof. Marie Pierre Krafft  
Institut Charles Sadron (ICS, UPR CNRS 22),  
Université de Strasbourg, Strasbourg (France)

タイトル : **Fluorine in Soft Matter Science**

日時 : 2015年5月13日(水) 17:00-18:00

場所 : 医心館北棟4階 IN409N (N-A 輪講室)

上記の部屋が使用中の場合 医心館北棟2階 IN209N

問合せ先 : 理工学部 塩井章久, 生命医科学部 吉川研一, 剣持貴弘



Fluorocarbons (FCs) and *F*-alkylated moieties offer a unique combination of properties, including extreme hydrophobicity together with lipophobic character, quasi-insolubility in water, yet spreadability on a water surface and high volatility relative to molecular weight.[1] We will show that *F*-alkylated surfactants provide an effective driving force for manipulating thin soft matter films self-assembled at the air/water interface. pH-Sensitive microbubbles with outstanding shell elasticity were obtained from *F*-alkyl phosphates (Fig. 1a).[2] The reinforcement of the interfacial film by the *F*-chains allowed grafting of magnetic nanoparticles,[3] thus providing novel dual-mode MRI/ultrasound contrast agents. FC gases interact with phospholipid self-assembled interfacial films, and profoundly modify the formation, stability and behaviour of these films. The kinetics of adsorption of phospholipids at the air/water interface were substantially accelerated and their interfacial tensions at equilibrium were strongly decreased by a FC gas.[4] Moreover, this gas modified the competitive adsorption of phospholipids versus albumin at the interface, reversing its “normal” outcome, which has important fallout on the design of novel lung surfactant substitutes.[5] We will also present the spontaneous generation of ordered ensembles of liquid FC droplets that spontaneously undergo synchronous translational motion on water.[6] The droplets are ejected as linear surface jets and form quasi-hexagonal patterns (Fig. 1b). These patterns exhibit repeated shrinking/expanding cycles. Such dynamic self-assemblies capable of collective motion may mimic the complex organization of living organisms.

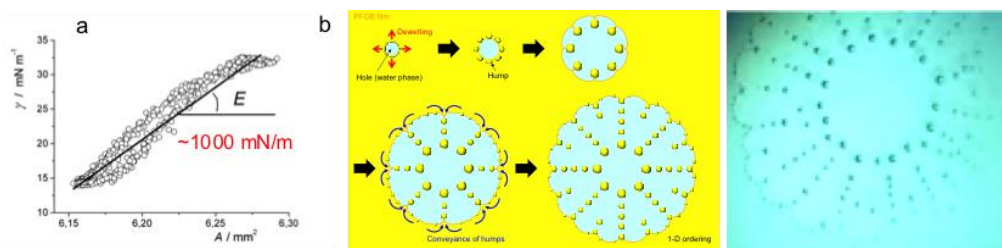


Figure 1: a) Exceptional elasticity of microbubbles' shells conferred by *F*-surfactants; b) Fluorocarbon droplets moving spontaneously and synchronously on water, forming dynamic self-assemblies.

- [1] M. P. Krafft, *Acc. Chem. Res.* **2012**, *45*, 514-524; M. P. Krafft, J. G. Riess, *Chem. Rev.* **2009**, *109*, 1714.
- [2] A. Kovalenko, *et al.*, M. P. Krafft, *Langmuir* **2014**, *30*, 6339; A. Kovalenko, *et al.*, M. P. Krafft, *ChemPhysChem* **2014**, *15*, 2440.
- [3] A. Kovalenko, P. Polavarapu, M. P. Krafft, G. Waton, G. Pourroy, *Soft Matter* **2014**, *10*, 5147; P. N. Nguyen, *et al.*, M. P. Krafft, *RSC Adv.* **2013**, *3*, 7743.
- [4] C. Szijjarto, S. Rossi, G. Waton, M. P. Krafft, *Langmuir* **2012**, *28*, 1182; P. N. Nguyen, T. T. Trinh Dang, G. Waton, T. Vandamme, M. P. Krafft, *ChemPhysChem* **2011**, *12*, 2646.
- [5] P. N. Nguyen, M. Veschgini, M. Tanaka, G. Waton, T. Vandamme, M. P. Krafft, *Chem. Commun.* **2014**, *50*, 11576; P. N. Nguyen, G. Waton, T. Vandamme, M. P. Krafft, *Angew. Chem. Int. Ed.* **2013**, *52*, 6404; P. N. Nguyen, G. Waton, T. Vandamme, M. P. Krafft, *Soft Matter* **2013**, *9*, 9972.
- [6] D. Yamamoto, C. Nakajima, A. Shioi, M. P. Krafft, K. Yoshikawa, *Nat. Commun.* **2015**, accepted.