P.42 Design of patchy polymersomes with topological surface patterns at the nanoscale

L Messager[1], L Ruiz-Perez[1], B McKenzie[2], P Bomans[2], J Gaitzsch[1], N Sommerdijk[2] and G Battaglia[1]

[1]Deparment of Chemistry, University College London, UK, [2]Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, The Netherlands

In Nature, biological membranes are composed of several components, which have been found to display nanometer and micrometer surface domains, called “rafts”.[1] Such domains play an important role in many biological processes such as cellular signaling, membrane trafficking and membrane modeling. To unravel the molecular basis and role of lipid surface domains in these processes, giant unilamellar vesicles have been widely studied as a mimicking system.[2]

Our research rather focuses on the design of complex artificial systems using synthetic membrane forming diblock copolymers as main constituents, because of their known enhanced mechanical properties and stability. These polymeric systems, a.k.a. polymersomes have recently yielded vesicles with patterned surfaces, using binary mixtures of diblock copolymers. Their surface topology could be controlled by the molar ratio of both block copolymer chains as well as their molecular weight. [3,4] However, it was observed that such systems evolve upon ageing towards asymmetric polymersomes, where phase segregation of diblock copolymers occurred.

To slow down this phenomenon, we propose to combine a diblock copolymer AB and a triblock copolymer ABC to prepare patchy polymersomes. In that case, the triblock copolymer would stabilize the patterns within the membrane, thus acting as a lineactant. To validate this concept, series of polymersomes made of PMPC-PDPA and PMPC-PDPA-PEO were prepared and characterized using TEM, DLS and cryo-TEM. Systematic analysis using FFT filtering was performed on the images to estimate the size of patterns and their evolution over time.

[1] Simons, K.; Ikonen, E. *Nature* 1997, *387*, 569
[2] Eggeling, C.; Ringemann, C.; Medda, R.; Schwarzmann, G.; Sandhoff, K.; Polyakova, S.; Belov, V. N.; Hein, B.; Von Middendorff, C.; Schonle, A.; Hell, S. W. *Nature* 2009, *457*, 1159
[3] Massignani, M.; LoPresti, C.; Blanazs, A.; Madsen, J.; Armes, S. P.; Lewis, A. L.; Battaglia, G. *Small* 2009, *5*, 2424
[4] LoPresti, C.; Massignani, M.; Fernyhough, C.; Blanazs, A.; Ryan, A. J.; Madsen, J.; Warren, N. J.; Armes, S. P.; Lewis, A. L.; Chirasatitsin, S.; Engler, A. J.; Battaglia, G. *ACS Nano* 2011, *5*, 1775