Metallo-Supramolecular Micellar Gels: A Structural Study

Clément Mugemana[a], Arnaud Joset[b], Pierre Guillet[c], Marie-Sousai Appavou[d], Nicolas De Souza[e], Charles-André Fustin[a], Bernard Leyh[b]* and Jean-François Gohy[a]**

[a]Université catholique de Louvain, Institute of Condensed Matter and Nanosciences (IMCN), Bio- and Soft Matter (BSMA), Place Pasteur 1, 1348 Louvain-la-Neuve, Belgium, jean-francois.gohy@uclouvain.be, charles-andre.fustin@uclouvain.be

[b] University of Liège, Department of Chemistry,Molecular Dynamics Laboratory, B-4000 SART-TILMAN, Belgium, bernard.leyh@ulg.ac.be

[c]Université d'Avignon et des Pays de Vaucluse, Equipe Chimie Bioorganique et Systèmes Amphiphiles, 84000 Avignon, France

[d]Forschungszentrum Jülich GmbH, Jülich Centre for Neutron Science at FRM II Lichtenbergstr. 1- 85747 Garching Germany

[e]Bragg Institute, Building 87, Australian Nuclear Science and Technology Organisation, Locked Bag 2001, Kirrawee DC NSW 223, Australia

The formation of metallo-supramolecular micellar gelsis investigated by SANS.The micelles consist of polystyrene-*block*-poly(*tert*-butylacrylate), PS-*b*-PtBA-[,(-[isterpyridine) block copolymers, dissolved in deuterared ethanol,which guarantees a significant contrast.

The hydrophobic polystyrene core is stabilized by the poly(*tert*-butylacrylate) corona.The influence of the copolymer concentration on the micellestructure and on its space organization has beeninvestigated, as well as thesignificant rheological impact of the subsequent addition of three metal ions (Fe(II), Ni(II) and Zn(II)).

The form factor of the micelles isdescribed using thePedersen and Gerstenberg model[1], with a solvent-free spherical core and gaussian PtBA chains.The fitting parameters are the average radius of the core, the standard deviation of its size distribution, and the radius of gyration of the PtBAchains.

Upon increasing thecopolymer concentration, the average distance between the micellesdecreases and interparticle interferences lead to a structure factor peak at increasing *q* values.Thisbehaviour has been taken into account through the Percus-Yevick hard sphere model[2]. Two new parameters are introduced: the hard sphere interaction distance and the hard sphere volume fraction in the solution.

The structural parameters characterizing both the micelles and the network built upon gelation have beendetermined upon increasing concentration and addition of several metal ions. Theresults arecorrelated with dynamic light scattering, electronic microscopy and rheology experiments.

1. Pedersen, J. S.; Gerstenberg, M. C. *Macromolecules***1996**, *29*, 1363-1365.
2. Percus, J. K.; Yevick, G.; *J. Phys. Rev***1958**, *110*, 1-13.