

**Experiment title:**

Diffusion and Hydrodynamic Properties of PS-PEO Copolymer Micelles in a Room Temperature Ionic Liquid

Experiment number:

HD-477

Beamline:	Date of experiment: from: 01/09/2010 to: 07/09/2010	Date of report: 08/03/2011
Shifts:	Local contact(s): Orsolya CZAKKEL	<i>Received at ESRF:</i>

Names and affiliations of applicants (* indicates experimentalists):

Valentina Villari*

Istituto per i Processi Chimico-Fisici
Consiglio Nazionale delle Ricerche
V.le Ferdinando Stagno d'Alcontres 37
98158 Messina ITALY

Norberto Micali*

Istituto per i Processi Chimico-Fisici
Consiglio Nazionale delle Ricerche
V.le Ferdinando Stagno d'Alcontres 37
98158 Messina ITALY

Alessandro Triolo

Istituto di Struttura della Materia
Consiglio Nazionale delle Ricerche
Via del Fosso del Cavaliere, 100
00133 Rome, ITALY

Anders Madsen*

Laboratory ESRF
6 rue Jules Horowitz B.P 220
38043 Grenoble Cedex FRANCE**Report:**

By means of (light) photon correlation spectroscopy and static light scattering measurements we extracted an indirect evidence of the spatial scale of the charge density fluctuation of the room temperature ionic liquid 1-butyl-3-methylimidazolium tetrafluoroborate ($[bmim]^+[BF_4]^-$) used as solvent; indeed, by exploiting the surface of a PEO-based copolymer micelle (charged by selective absorption of the solvent cations) we found that the screening effect by charge fluctuations of the solvent on the repulsive potential exerted by micelle surface is finite and occurs in 1-2 nm range, in agreement with theoretical and simulation results.

The main idea of the experiment at ID10A was to explore the micelle diffusion across the QR~1 region, together with the structure factor, in order to investigate the hydrodynamic interactions far from the zero-Q limit of light scattering, through the determination of the hydrodynamic function $H(Q)=D_0S(Q)/D(Q)$. However, the experiment was unsuccessful due to an unfortunate combination between low scattered signal and fast damage under X-ray beam. Therefore, it was not possible to collect either correlation function or structure factor.

We think that the PEO block of the copolymer is extremely sensitive to free radicals eventually formed in the solvent under X-ray beam.