



<b>Experiment title:</b> Probing anisotropic diffusion and hydrodynamics in magnetic fluids	<b>Experiment number:</b> SC-2337
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**Report :** The aim of the proposal was to investigate the dynamic and hydrodynamic behavior of magnetic colloidal dispersion in zero field and under an applied magnetic field by 2D-XPCS. The experiment was conducted at ID10 A beamline in ESRF. X-rays at 7.05 keV ( $\lambda = 1.75 \text{ \AA}^{-1}$ ) selected by a Si(111) crystal were used. The beam was focused by a CRL placed in the optics hutch and a  $20 \times 20 \text{ }\mu\text{m}$  beamsize was selected by using roller-blade slits. The estimated flux was  $\sim 3.7 \times 10^8$  ph/sec. The sample detector distance was 1270 mm. The samples, in 0.3 mm capillaries were placed in the low temperature SAXS chamber, with capabilities of applying external magnetic field perpendicular to the beam propagation. Temperature stability was better than 0.01K. The scattered intensity was measured by direct illumination CCD (Princeton) with the pixel size  $22.5 \times 22.5 \text{ }\mu\text{m}$ . The correlation function were obtained by processing the CCD images using multispeckle technique.

Several magnetic fluid samples were prepared (see table 1) all based on maghemite nanoparticles dispersed at large concentration (of the order of 12 vol%) in various carriers polar and non polar, presenting a glass transition at low temperature (plus one sample more concentrated, already glassy at room temperature, that we did not used). Our first concern was to select a system which would not present beam damage (see table 1). We have been able to probe dynamically only two samples (S3 and S7) under field prior any beam damage.

Sample	Solvent	Temperature (K)	Field (mT)	beam damage
S7	dibutylphthalate	295, 190	15, 60, 110	no
S1	water	295	0	-
S2	propylene glycol	295, 190	0	yes
S6	glycerin	295	0	-
S8	dibutylphthalate	295, 260, 240	0	yes
S3	propylene glycol	295, 190, 178, 179	15	yes
S4	glycerin	295, 187, 200, 190, 195, 198, 199	0	yes

The SAXS pattern of sample S7, a dispersion of magnetic nanoparticles in dibutylphthalate under-field at 190 K is shown in Fig.1. The interparticle repulsions are weak and under the

