ESRF	**Experiment title:** Direction dependent diffusion of rodlike colloidal particles	**Experiment number:** SC2825
Beamline: ID10A	**Date of experiment:** from: 20.1.2010 to: 26.1.2010	**Date of report:** 27.2.2013
Shifts: 24	**Local contact(s):** Anders Madsen	*Received at ESRF:*

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Report:

Well defined hematite particles with comparatively small polydispersity can be prepared with tunable aspect ratio $1 \leq \nu \leq 5$. Due to the negative anisotropy of their magnetic susceptibility, these particles align with their long axis perpendicular to the direction of an external field at moderate flux densities in the range of several millitesla [1].
Chosing the direction of the scattering vector $\mathbf{Q} \parallel \mathbf{H}$ and $\mathbf{Q} \perp \mathbf{H}$, different averaged translational diffusion coefficients can be measured. From these average diffusion coefficients, the principal values of the anisotropic diffusion tensor $D_{\parallel}$ and $D_{\perp}$ can be calculated.
The ratio $D_{\parallel}/D_{\perp}$ is investigated in dependence on the particles' ratio of half axes. For these spindle shaped particles, the ratio $D_{\parallel}/D_{\perp}$ can heuristically be described with a rescaled version of the theoretical approach derived by Perrin to describe the ratio $D_{\parallel}/D_{\perp}$ for ellipsoids of revolution.
The results of the experiment are published in [2].

References

[1] Christian Märkert, Birgit Fischer, and Joachim Wagner. Small-angle scattering from spindle-shaped colloidal hematite particles in external magnetic fields. *Journal of Applied Crystallography*, 44(3):441–447, Jun 2011.

[2] Joachim Wagner, Christian Märkert, Birgit Fischer, and Leonard Müller. Direction dependent diffusion of aligned magnetic rods by means of x-ray photon correlation spectroscopy. *Phys. Rev. Lett.*, 110:048301, Jan 2013.