EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

ESRF

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office using the **Electronic Report Submission Application:**

http://193.49.43.2:8080/smis/servlet/UserUtils?start

Reports supporting requests for additional beam time

Reports can now be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Deadlines for submission of Experimental Reports

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.

ESRF	**Experiment title:** Structure of shear ordered charge stabilized colloid Dispersions	**Experiment number**: SC-805
Beamline: ID02A	**Date of experiment**: from: 11 Apr. 01 17:00 to: 14 Apr. 01 7 :00	**Date of report**: 10. Sep. 01 *Received at ESRF:*
Shifts: 9	**Local contact(s)**: URBAN Volker	

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Report:

The structural behavior of electrostatically stabilized latex spheres was studied by using Light (LS) [1,2], and Small Angle Neutron Scattering (SANS) [3,4]. The particles we used (d=93 nm, Φ=0.34) were prepared in our laboratory from polystyrene dispersed in water as solvent. By the application of shear the dispersion can be ordered forming hexagonal layers. The stacking sequence of the layers, which is accessible by measuring the intensity distribution along Bragg rods, defines the structure of the crystalline dispersion [5,6,7]. The observed structure differs from typical equilibrium structures like fcc or bcc. In order to obtain the intensity distribution along the Bragg rods a Couette cell as well as a disk shear cell can be used. A possible explanation starts from the reciprocal structure of a shear induced hexagonal layer of colloid particles as shown in Fig. 1. In this figure the axis of flow is indicated. Rotations about this flow axis are called α-rotations, about an axis perpendicular to it are named β-rotations in the following.

Since the concept has not been checked experimentally we checked it during our last campaign. Fig. 2 serves to analyze Bragg reflections. It shows Bragg rods which are intersected by the Ewald sphere (more a plane for small angle scattering) by α-rotations and β-rotations. For β-rotations the point of intersection of rods crossing the β-axis ($(1\underline{1})$;$(\underline{1}1)$ etc.) is not moved by a variation of β. With β-rotation it is not possible to measure the intensity along the rods $(1\underline{1})$ or $(\underline{1}1)$ which belong to the first ring. On the other hand, the intensity along these rods, as Fig. 2 shows, can be determined by α-rotation. This is one reason why we preferred to use α-rotation in our previous neutron studies. In passing we note that with the Couette cell commonly only β-rotations are carried out [8].

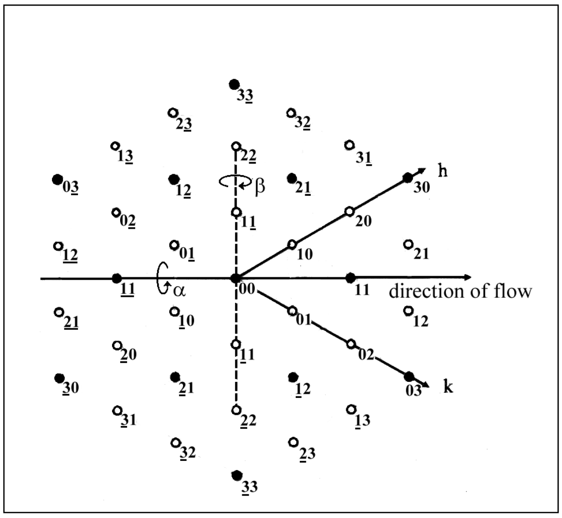

Fig. 1: A hexagonal layer in reciprocal space with Miller indices, α- and β-axes are indicated

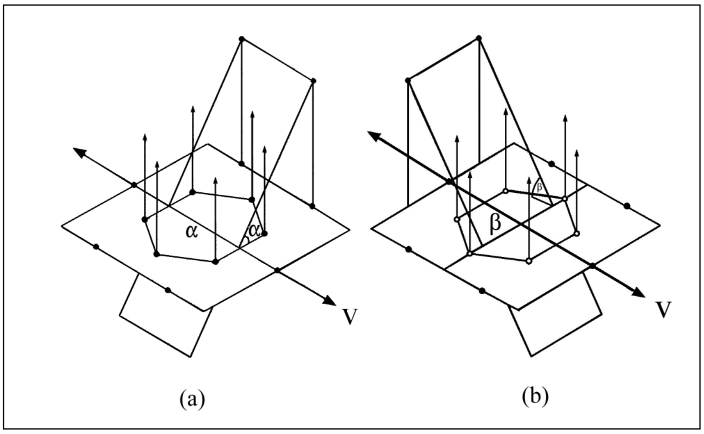

Fig. 2: Tow possible orthogonal directions of intersecting the Bragg rods by the Ewald plane (sphere). The direction of shear flow is indicated by an arrow. The orthogonal axes for rotations of type α and β are indicated. For β-rotations the Ewald plane do not change the height of the intersection for the rods $(1\underline{1})$ and $(\underline{1}1)$.

Fig. 3 shows the *l* dependence of the intensity distribution for the Couette cell as well as the rotating disk cell for a β-rotation. The system at rest as observed by synchrotron scattering is described in [6,7]. The upper part of Fig. 3 describes the intensity along the rod (01) for the Couette cell (β-rotation). The part below shows the intensity distribution for rod $(1\bar{1})$on the rotation axis as a function of the angle β for both a (Couette and rotating disk) cell.

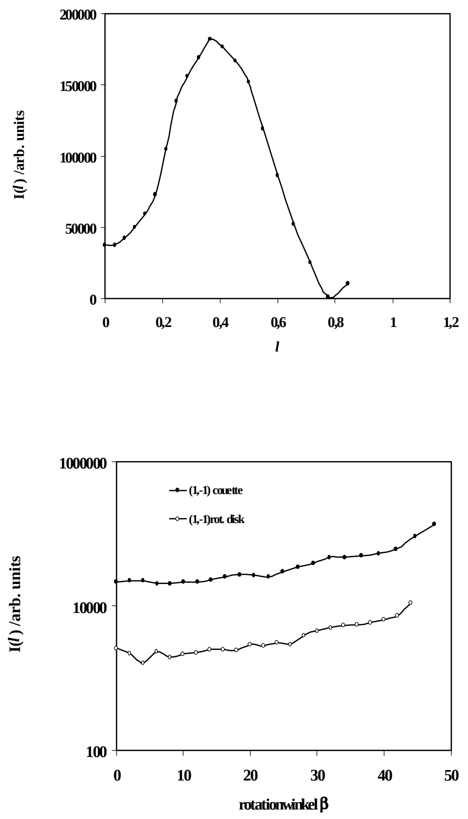

Fig. 3

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