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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

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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

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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;
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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-669
Beamline: ID02A	**Date of experiment**: from: 16 Feb. 00 15:00 to: 19 Feb. 00 7 :00	**Date of report**: 15. Aug. 00
Shifts:	**Local contact(s)**: URBAN Volker	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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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 particels can be ordered by shear in 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 [6,7].The particles we used (d=93 nm, Φ=0.34) were prepared in our laboratory from polystyrene dispersed in water as solvent. The observed structure, which the hexagonal shear ordered layers accept, differs from typical equilibrium structures like fcc or bcc. In order to obtain the intensity distribution along the Bragg rods we rotated the measuring cell (see Fig. 1), the model we used is explained in [4]. We observed that rotating the measuring cell at rest and increasing the shear rate leads to a similar behavior. Starting from ordered layers at rest with six-fold symmetry we slowly increased the shear rate. A few minutes after turning the shear on the crystall as well as the six-fold symmetry will be destroyed at very small shear rate.

Further increasing the shear rate results in an induced correlation of the layers and the reflexions will be ordered again (shear induced order) [8].We suppose, that the reorganized shear induced structure as shown in Fig. 2) depends on the yield stress. Below this point the dispersion exhibits a viscoelastic range, in which the elastic property is predominant. The crystall will be destroyed wen it is sufficiently deformed. Fig. 2a) shows the Bragg reflections of the layered sample at rest. In Fig. 2b) the same reflections are shown as obtained with a shear rate $\dot{\gamma}$=0.01/s. Fig 2c) shows the same sample at a higher shear rate $\dot{\gamma}$=20/s, and as the shear rate is further increased a layer-like scattering pattern is observed again as shown in Fig. 2d).

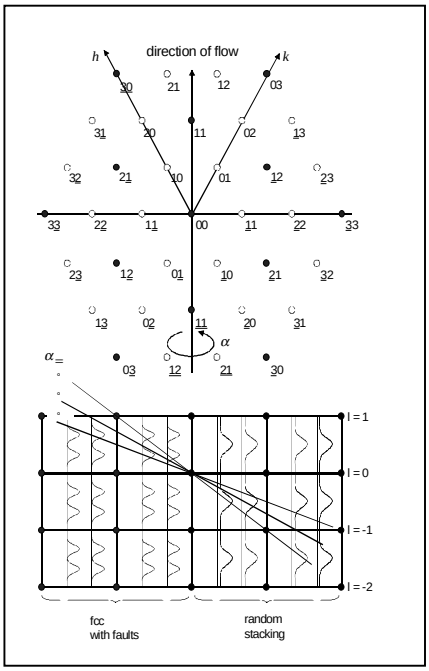

Fig. 1

0°, at rest

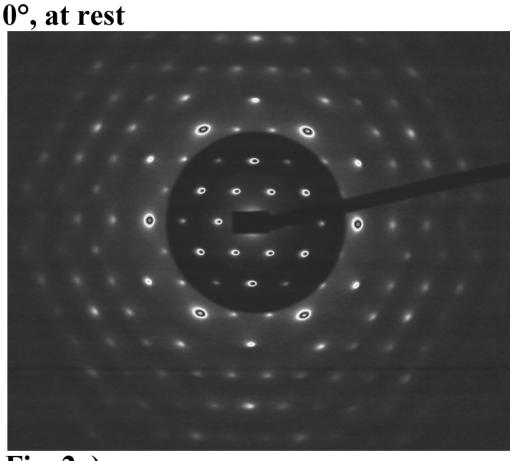

Fig. 2a)

0°, under shear, 0.01/s

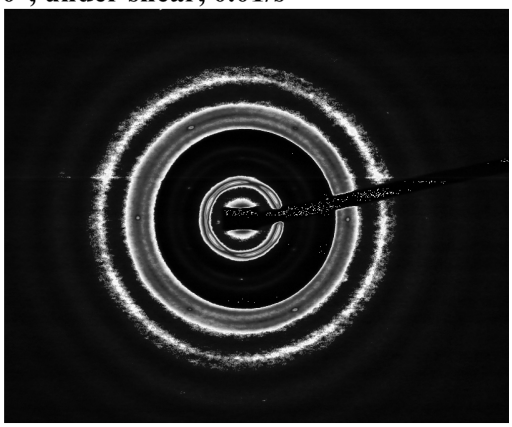

Fig. 2b)

0°, under shear, 20/s

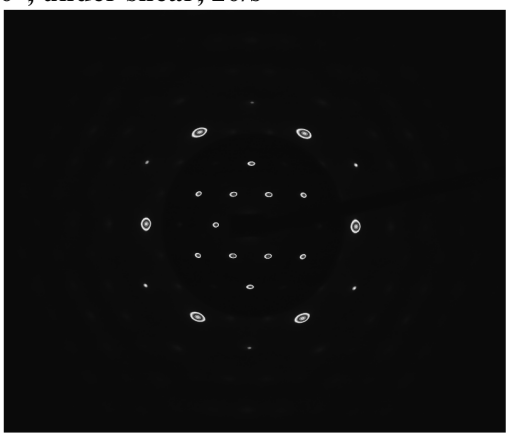

Fig. 2c)

0°, under shear, 1000/s

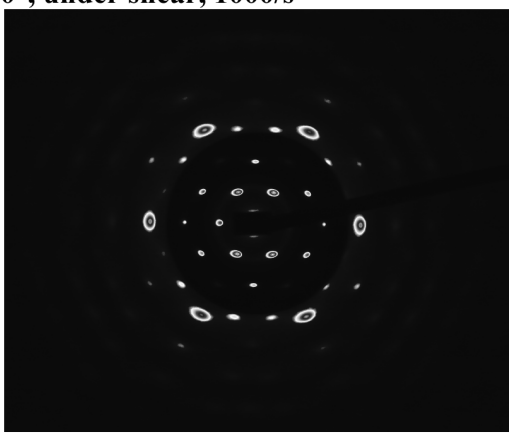

Fig. 2d)

Fig. 3 shows the *l* dependence of the intensity distribution for the two types of Bragg rods for the first time for a shear induced ordered layered system after turning the shear off (at rest) observed by synchrotron scattering.As described in [6,7] we found that the rods (h-k) = 3n, n integer, have their maximum at *l*=0, 1, 2,…. . By contrast, the maximum for the rods with (h-k) = 3n ± 1 was found at *l* =0.5, 1.5, ….. . This also proves the correctness of our assumption that the layers are correlated in a "random stacking" pattern.

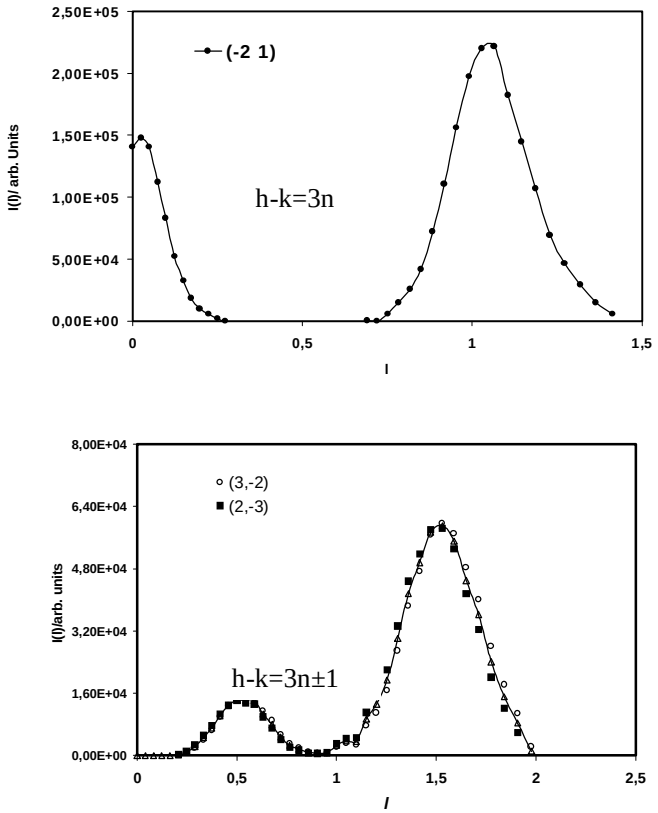

Fig. 3

references

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