ESRF	**Experiment title:** Internal Dynamics of Fractal Aggregates of Metal Colloids – studied by x-ray photon correlation spectroscopy at high scattering vectors	**Experiment number**: SC438
Beamline: ID10	**Date of experiment**: from: 2.2.98 to: 10.2.98	**Date of report**: 26.8.00
Shifts: 21	**Local contact(s)**: D. Abernathy	*Received at ESRF:*

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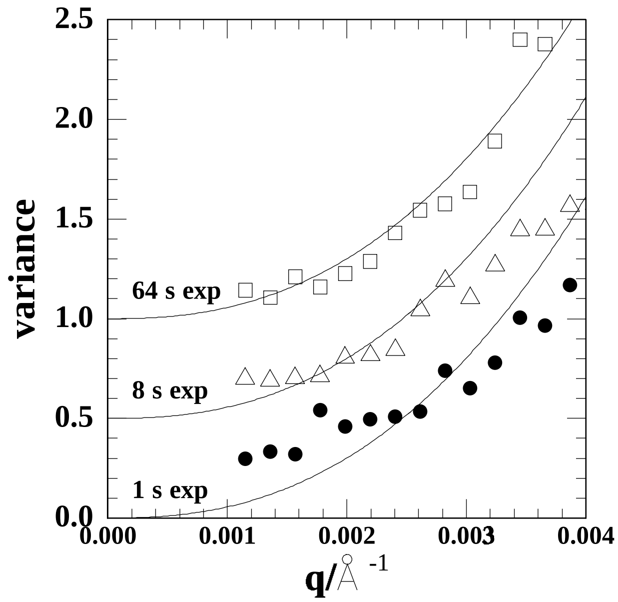
Report:

Photon correlation spectroscopy (PCS) using coherent x-rays is a technique developed during the last few years to study slow dynamics on small length scales. We demonstrated the application of XPCS to the study of aggregate solutions in previous experiments [1,2]. In comparison to PCS with visible light the use of x-rays is restricted due to the limited scattering intensity of many systems of interest. The use of 2D detectors promises to overcome this problem [3], but these experiments are on the other hand limited in time scale due to the readout time of CCD-detectors.

Since in our investigations of the dynamics of aggregates there is a need to extend the experimentally accessible time and q-range in order to study internal dynamics, we started using a CCD detector. Our approach was to use the information contained in integrated exposures for different exposure times. In PCS the dynamics in the sample lead to a fluctuating speckle pattern, the time scale of the fluctuations reflecting the time scale of the dynamics in the sample. For short enough exposure times the speckle pattern is visible on the images recorded on the detector. But its contrast decreases with increasing exposure times and is averaged out when the exposure time is much longer than then the typical time scale of the fluctuating pattern. Since exposure times can be controlled independently there is no limitation by the readout time of the detector in this approach. The problem in the practical appliation of this concept is to separate the speckle pattern from the superimposed statistical fluctuations due to counting statistics. This can be achieved using the fact that the statistical properties of the two kinds of fluctuations are different.

In the experiment reported here we applied these concepts to measurements performed on fractal aggregate solutions. While we were able to show that the basic ideas of the proposed concept are applicable, further work is necessary including optimization of the experimental setup in order to use the approach to enlarge the accessible time and q-range of these experiments.

The figure shows as an example the result of a simple statistical analysis of a scattering pattern fluctuating on a known time scale. Shown is the variance of the recorded scattering intensity pattern as a function of scattering vector. Data from exposures of 1s, 8s and 64s exposure time are shown.The primary beam intensity was adjusted to keep contributions due to counting statistics comparable. For low q the pattern fluctuates on a time scale of a few seconds. This is clearly vivsible in the 1s exposure, for which there is a large excess contribution in the variance on top of the contribution due to counting statistics as indicated by the line. This exess contributions decreases and then disappears for the longer exposure time.



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