ESRF	**Experiment title: USAXS studies of the grain-growth kinetics in nanocrystalline and amorphous Chromium.**	**Experiment number**: HS 1706
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Names and affiliations of applicants (* indicates experimentalists):

R. Przeniosło (*)

ILL Grenoble and Institute of Experimental Physics, Warsaw University, Poland

W. Sławinski (*), G. Chojnowski(*), I. Sosnowska

Institute of Experimental Physics, Warsaw University, Poland

M. Bukowski (*) and R. Hempelmann

Inst. of Physical Chemistry, University of Saarbrücken, Germany

Report:

The microstructural studies of electrodeposited nanocrystalline n-Ni, n-Co [1] and n-Cr [2] by small angle neutron scattering (SANS) have shown fractal-type density correlations. Such fractal microstructures contribute to a small angle scattering (SAS) signal which does not obey the Porod law, but show a power-law behaviour $I(Q) \propto Q^{-\alpha}$, where the exponent α has values between 2 and 4.

On the other hand, many nanocrystalline metallic materials undergo a grain growth process during annealing [4-5]. The changes of the crystalline microstructure of n-Cr were already studied by time dependent SR diffraction at the beamline ID-31 [6]. Diffraction measurements provided information about increase of the average grain size [6]. In the present study, the microstructure of n-Cr and amorphous Cr (am-Cr) was studied by time dependent SAXS measurements performed during annealing at several temperatures.

The SAXS signal measured at RT before annealing have shown a power-law behaviour in a similar way as it was observed in earlier SANS studies [1]. During annealing we observe an increase of the exponent α towards a value of 4 which corresponds to a Porod law describing SAS on smooth objects. The resulting time dependence of the exponent α obtained for different temperatures is shown in Fig. 1.

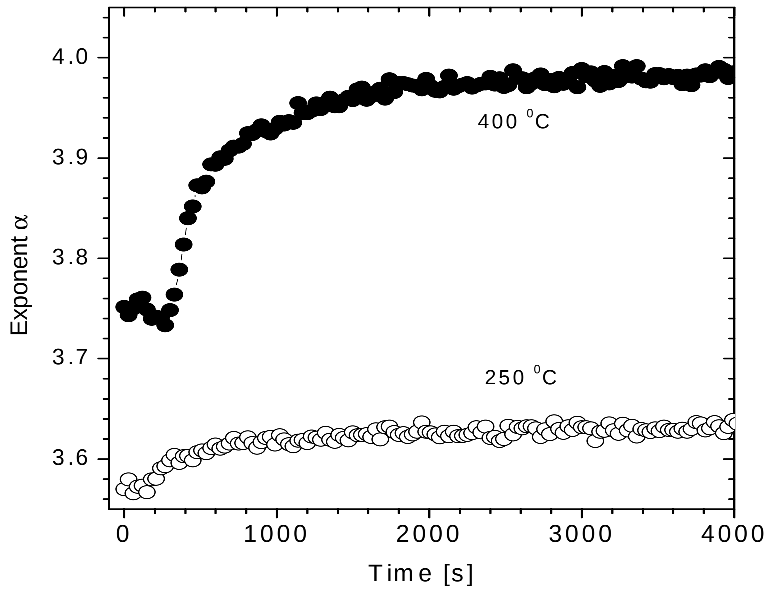

Fig.1 Time dependence of the power-law exponent α obtained from time-dependent SAXS measurements performed during annealing of nanocrystalline (n-Cr) at 250 ^{0}C and 400 ^{0}C. The lines are shown to guide-the-eye.

One can see that with annealing at 400 ^{0}C the exponent appraoches very close to the Porod law value of 4. Annealing at 250 ^{0}C also increases the value of the power-law exponent, but it saturates at a value much smaller than 4. Further data analysis is in progress.

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