FZ4R ROBL-CRG	<b>Experiment title:</b> <i>Stress Relaxation in CrN Layers</i>	Experiment number: 20_02_022
<b>Beamline</b> : BM 20	Date of experiment:   from: 23.06.1999   to: 24.06.1999	Date of report: 27.08.99
Shifts: 6	Local contact(s): Dr. Norbert Schell	Received at ROBL: 30.08.99

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## Report:

To get information on the high-temperature mechanical properties of magnetron-sputtered CrN hard coatings, the defect annealing and corresponding stress relaxation of the coatings were studied in the temperature interval from room temperature to 750 <sup>o</sup>C.

During *in-situ* X-ray diffraction experiments, the positions (planar distances) and widths (connected to inhomogenuous strain, i.e. defects) of two selected diffraction peaks, (111) and (200), were monitored as a function of time for various temperatures for two films with thicknesses of approximate 0.6 and 1.1  $\mu$ m.

Some of the results are illustrated in the figure, where the width of the (111) peak of the thick sample is shown as a function of the annealing temperature. The triangles are data points taken as the temperature was changed in steps from the ambient temperature to the temperatures indicated. Data points lying on vertical lines reflect the change of the width with time at fixed temperatures. Defect annealing (a decrease in the width) is observed at temperatures of 500<sup>o</sup>C and above. The circles are data points taken during the cooling-down cycle.

Further data are required for a detailed understanding of the kinetics of the process. For a characterisation of the defect structure before and after annealing, transmission-electronmicroscopy studies are also required. In addition, hardness measurements have to be carried out to study the change in mechanical properties with the change in defect structure. Both electron-microscopy and hardness measurements are in progress in Aarhus.

