Aleksandra Banaś 13.09.2007

Supervisor: ***Dariusz Zając***

PROJECT REPORT

SUMMER STUDENT PROGRAM 2007

Project:

Rocking curves measurements at the beamline E4 in function of energy for different plane mirrors (Au, Ni, C) and their implementation to the Online (Spectra) code.

Report:

The change of the maximum rocking curve in function of the energy is crucial for the correct setting of set point in DMostab especially for beamline with complicated focusing system.

I had to measure intensity in function of energy and than get dependence of photon flux Φ to energy. Using formula:

$$\Phi = \frac{I_{IC1}}{(1 - e^{-\mu d})} \frac{32\ eV}{E}$$

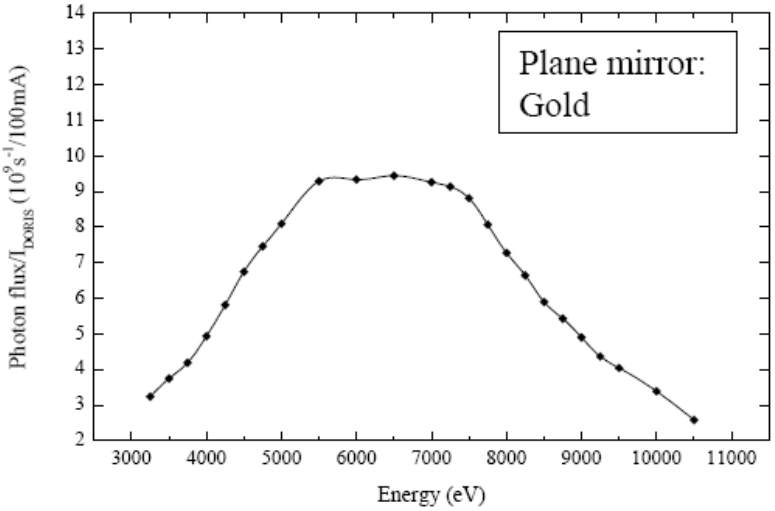
$where\ \ \mu_{gas} = P[mbar] \frac{M}{A} \frac{f_2}{E[eV]} \frac{1}{0.573} [cm^{-1}]$

$M\ and\ A\ are\ the\ molecular\ and\ atomic\ weights$

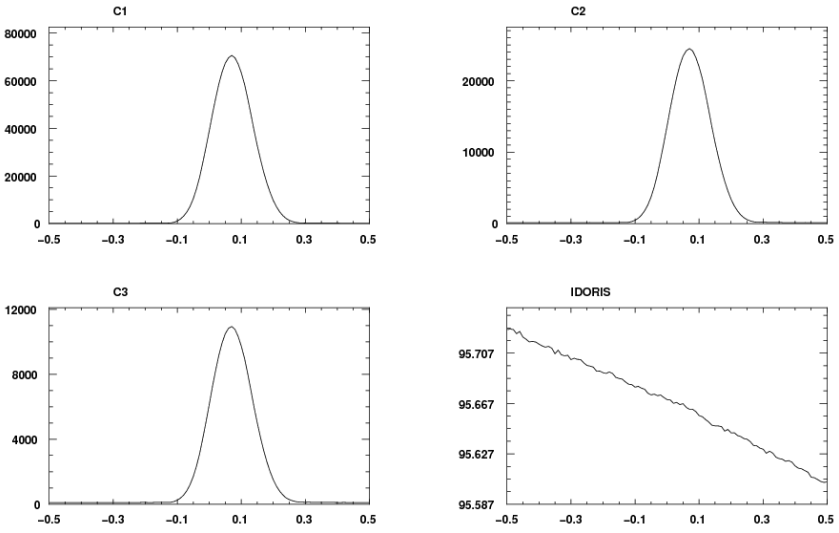
$f_2 - \ scattering\ factors$

$^{E}/_{32eV} - \ the\ number\ of\ electrons\ produced\ by\ one\ absorbed\ photon$

can be received graph like this:

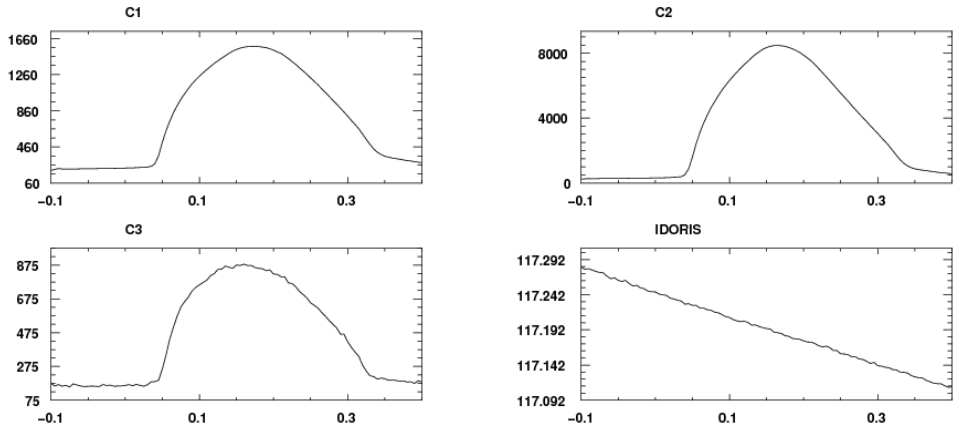


Unfortunately, during my measurements (and also before) it was noticed that something is wrong with the beam. After scanning the theta angle (motor 12 is responsible for this) I should see symmetric curve - it means that the height of the plane mirror is correct. The curves I saw were not correct and the intensity was too low.

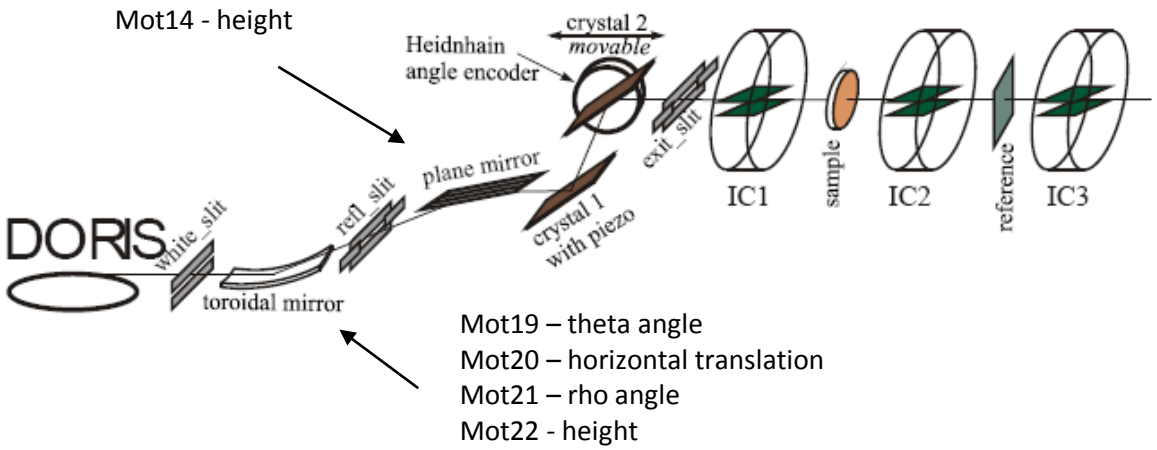


CORRECT

NOT CORRECT



Because of it, the most important thing was to align the beam. In order to do it we should find correct positions of motors which are responsible for shape and intensity of the beam. I instructed with the layout of the beamline E4 and motors functions.



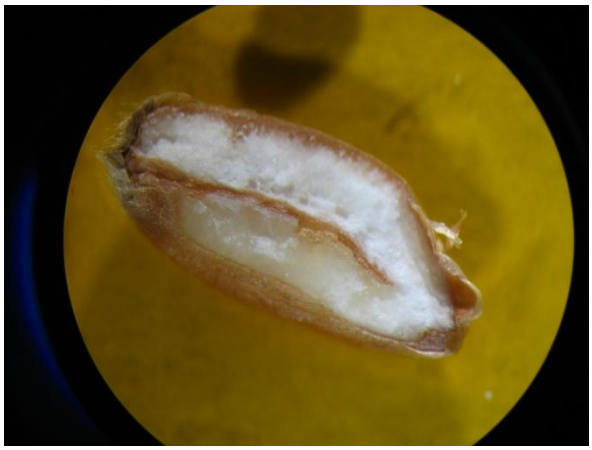
All align was very complicated because it was noticed that there is also a problem with monochromator – picture of the beam was not correct, that is why it lasted all 2 weeks. When everything was repaired we have no more beam time.

I participated in measurement at the beamline C (CEMO) – dedicated to X-ray Absorption Spectroscopy. I instructed with the beamline layout, experimental station, beamline manual and I learned how to use the software On-line that controls the setup and runs the data acquisition.

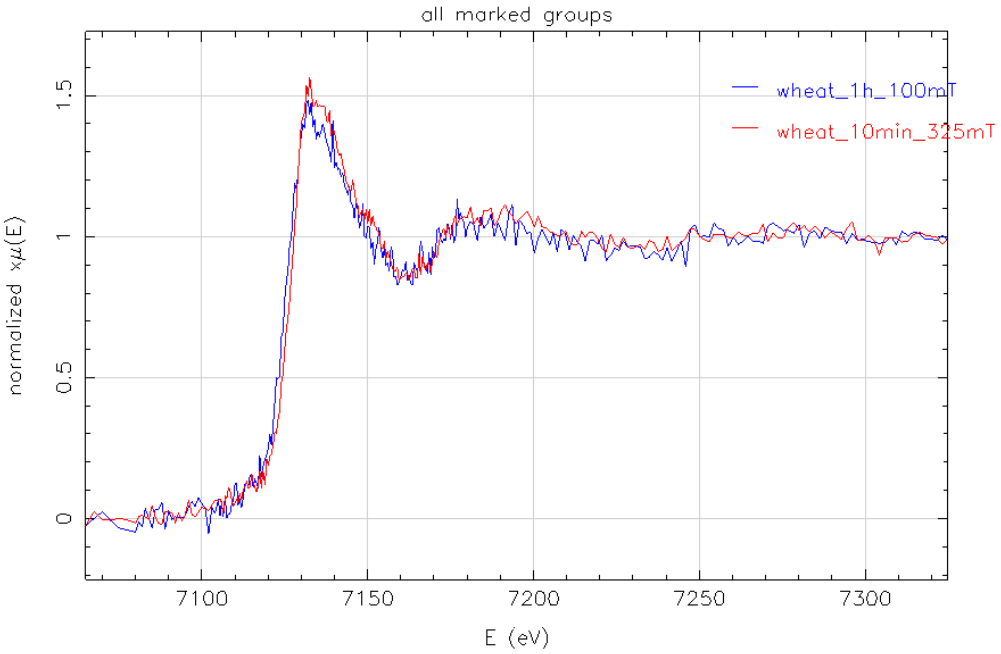
I did also my own measurements. Samples were measured in Extended X-Ray Absorption Fine Structure experiment in fluorescence geometry using new 7 cell Silicon Drift Diode detector designed by Edmund Welter.

Samples: wheat seeds stimulated in magnetic field – 100mT during 1 hour and 325mT during 10 minutes. I did X-Ray Absorption Near Edge Spectroscopy study of iron oxidation state in this seeds.

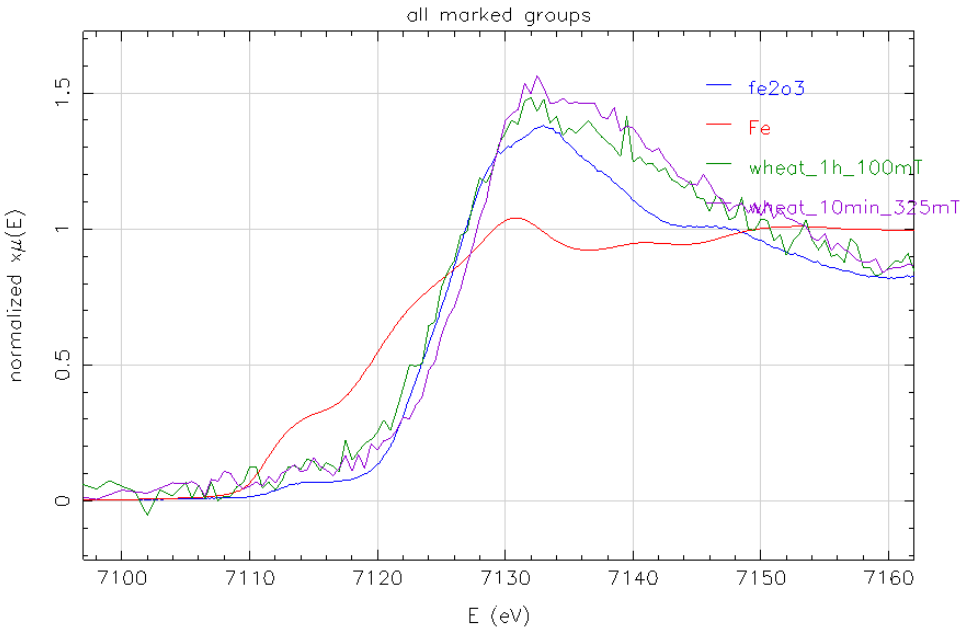
Pictures of measured seeds:



EXAFS spectra of iron in both samples were done in program Athena :



XANES spectra of iron in samples: wheat_1h_100mT, wheat_10min_325mT and XANES spectra of the references: iron foil – Fe ions are in the 0 oxidation state and Fe_2O_3 - iron ions oxidation state is +3 :



XANES spectra of iron in samples wheat_1h_100mT and wheat_10min_325mT look very similar to spectra of iron in hematite Fe_2O_3 . It mean that iron oxidation state in wheat sample are in +3 oxidation state and that stimulation in different magnetic field have no influence to change of an iron ions oxidation state in this seed.

I also took part in measurement at other X-Ray Absorption Spectroscopy beamline: A1 and X1 and in measurement of TiO_2 at beamline E4 during exercise week.