

Project name: **Discovering and improvements of manufacturing processes in Cerkamed Company**

Beamtime Report

dd.mm.yyyy - dd.mm.yyyy (Date of the report to be added)

General information

Name of the rapporteur	Name of the rapporteur's organisation
Małgorzata Krasowska	PPH Cerkamed
Type of research (nanotechnology/health care/chemistry etc.)	Name of the research facility
Health care	HZB BESSYII,
Date of the measurement, duration	Location of the event
10.01.2014	UE52-PGM beamline and the MulticolourPES endstation
Facility personnel participating in the measurement	
Stefan Krause	

Description of the project

Research description (short summary as written in the application)
<p>Determination the quantitative and qualitative composition of two samples of paste used in dental fillers. Product consists of amino and epoxy resin (filled with inorganic fillers). Both react with each other in the ratio of 1:1 in polyaddition process. Desirable features of the product are: biocompatibility, fluidity, low shrinkage in polyaddition process, no by-products and tightness.</p>
Summary of activities (experiments performed, beamtime used, preliminary overview of results, next steps and other relevant information)
<ul style="list-style-type: none"> Measurements were conducted at UE52-PGM beamline and the MulticolourPES endstation: https://www.helmholtz-berlin.de/pubbin/igama_output?modus=einzel&sprache=en&gid=1894&typoid=35517 The sample current was used as TEY and a GaAs diode with a biased grid in front was utilized at TFY detector. The bias voltages were for C edge, N-edge, and O edge -400 V, -500V, and -600V respectively. The angle of the incident light to the surface was 55° to avoid effects to the spectral shape due to orbital geometry. All experiments were conducted in UHV at pressures of $5 \cdot 10^{-9}$ mbar to $1 \cdot 10^{-8}$ mbar. The base pressure of the analysis chamber is $2 \cdot 10^{-10}$ mbar and the higher pressures during the measurement resulted from the strong degassing of the samples.

- To samples were measured marked as paste A and B and several reference samples.

The K-edges of C, N and O were measured for each paste and compare with reference substance to decide if they dominate in the paste after polyaddition process.

From the preliminary analysis of the measured edges the following conclusions were drawn:

None of the compared reference gives a good agreement with the Paste A spectrum, suggesting only very little or no presence in the Paste A. After polyaddition process new compound was created which dominate the spectra. The surprising was the observed N K-edge from reference ethylene glycol monosalicylate (EGM) which should not contain the nitrogen. This need clarification.

Similarly the contribution to the Paste B reference bisphenol A glycerodate diacrylate (BaGD) is again very small. New compound was formed during the polyaddition.

To identify the main C, N and O bonds dominate in the spectra of paste A and B the search of the literature is needed and numerical simulation of spectra.

The following conclusion can be drawn from performed measurements:

- The preparation of the samples was quite challenging due to their high vapor pressures.
- It would be good to have a way to dry the pastes other than heating (UV light?).
- The conductivity of the all samples was good enough to actually get the TEY and TFY spectrum allowing to look for depth dependence. However, no differences could be seen (compare slide 10)
- Overall no signs of any of the investigated solvents could be clearly identified in the NEXAFS spectra.

How would you describe cooperation and assistance from industrial liaison officers and national contact points while preparing and carrying out the research at large scale facilities?

The cooperation with the project coordinator was conducted satisfactorily. Mr. Rodrigo Coehlo is open-mind person, who react very quickly for presumptive problems and look after ongoing research. The results of the research didn't give the clear answer for the demanded subject, the research report introduced by Mr. Stefan Krause was not very clear. The professionalism and great knowledge of Prof. Krystyna Jabłońska from Physics Institute PAN helped us to interpret the results of the research and clarify the meaning of these results.

Other personal remarks

The cooperation between scientists from different disciplines and producers is essential for a comprehensive solution to the industrial problem, so I think that program Science Link is needed for the creation a linkage between science and industry.

Annexes

Annexes

(list of annexes; meeting minutes, graphical illustrations, tables and other supplementary data)

The power point presentation of the results is attached.

