Graduate School of Excellence MAINZ

Report of the 4th MATCOR Student Seminar

Lviv
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Anna-Maria Pütz

Institute of Inorganic and Analytical Chemistry
Johannes Gutenberg-University, 55099 Mainz, Germany

From Friday, the 28.08.2009 to Monday, the 31.08.2009 the fourth MATCOR Student Seminar took place in Lviv (Lemberg), Ukraine. For the first time, the location of the Student Seminar was choosen abroad and due to the strong support of three Ukrainian MATCOR students (Yuriy Khalavka, Dmytro Kutnyakhov and Katerina Medjanik) this outstanding Student Seminar could be realised. The historic city of Lviv in the Western Ukraine with its Unesco World Heritage listed city center was an attractive and inspiring location. The international character was further promoted by the fact that not only the participants of MAINZ (MATCOR, POLYMAT, IMPRS) were welcomed but also students from leading Western Ukrainian universities (Lviv polytechnic university, Lviv national university, Chernivtsi national University) were invited.

The workshop started with the "traditional" introduction games on Friday, so that every participant knew the names and got some general impression of the others. On Saturday, the scientific program was opened with some short talks concerning *HEUSLER compounds*. **Tobias Eichhorn (Prof. Jakob)** explained the magnetic shape memory effect of the martensitic phase of the Ni_2MnGa alloy and showed the potential as well as the problems of thin epitaxial films of this application-oriented research. **Christian Herbort (Prof. Jourdan)** introduced the advantage of a thin Mg layer in the Heusler based Tunneling Junction $Co_2Cr_{0.6}Fe_{0.4}Al$ /AlO_x/$Co_{70}Fe_{30}$ concerning the tunnelling magnetoresistance ratio and the corresponding amount of Julliere spin polarisation. The session was concluded by **Eberhard Jakobi (Prof. Blümer / Prof. van Dongen)**, who presented the improvement in calculation of correlation effects in half-metallic Heusler alloys by dynamical mean-field theory.

After the coffee break **Frank Reuter (Prof. Rentschler)** gave an introduction in coordination chemistry. He explained how chemists can play with different reaction parameters to obtain the complex with the desired physical properties. Then **Arpad Jakab (Prof. Sönnichsen)** opened the *NANO and more* short talk session with his talk "Plasmonic properties of Au-Cu alloy nanoparticles" where he presented the influence of the size, shape and composition of the nanoparticle on the plasmonic resonance energy. Next was **Yuriy Khalavka (Prof. Sönnichsen)**, who showed that a thin surface layer of carbon can enhance the thermal stability of gold and silver nanorods. After the lunch break, **Mykola Korkishko (Lviv Polytechnic National University)** introduced amorphous alloys as alternative to the present materials in thermometry. Last but not least, **Iryna Andrusenko (Dr. Kolb)** pointed out the advantage of electron crystallography concerning the structural determination of nano-scaled system on the example of different wolframates.

Figure 1: *first row (from left to right)*: Yuriy Khalavka, Shahab Naghavi, Christian Herbort, Tetiana Provalska, Dmytro Kutnyakhov, Christian Ohm; *second row (from left to right)*: Simone Jäger, Vajiheh Alijani, Xeniya Kozina, Kerstin Hild, Frank Reuter, Anna-Maria Pütz, Stephan Rix, Peter Roth, Iryna Andrusenko, Katerina Medjanik; *third row (from left to right)*: Olena Aksimentyeva, Volodymyr Tokach, Mark Bajohrs, Arpad Jakab, Mykola Korkishko, Christian Ludwig, Eberhard Jakobi, Tobias Eichhorn

Figure 2: Visit in the Museum of Rural Life in Lviv, Ukraine

According to the program the *THEORY* short talk session was next, so **Christian Ludwig (Prof. Felser)** introduced a cluster expansion for the Cu-In-Ga-Se-System, that is capable of a fast calculation of energies which are needed in Monte Carlo simulations. **Shahab Naghavi (Prof. Felser)** presented ab-initio binding energy calculation in nano graphene based molecules and compared them with experimental results obtained by ultra violet photoemission spectroscopy. The diffusion properties of point defects in CaF_2 were elaborated by **Stephan Rix (Prof. Felser)**, where especially the effect on the application as lenses material in microlithographic processes were investigated. Then was again a longer student talk by **Anna-Maria Pütz (Prof. Rentschler)** who explained a long-range magnetic ordering in a linear cobalt chain which could be determined by single crystal SQUID measurements.

The first scientific part was concluded by the short talk session about *PHOTOEMISSION*. First **Kerstin Hild (Prof. Elmers)** pointed out the advantages of a magnetic circular dichroism measurement by threshold photoemission on a Co/Pt sample. Then **Xeniya Kozina (Prof. Felser)** presented the hard x-ray photoemission of $Fe_{60}Co_{20}B_{20}$ thin films and how it can be used to optimize the magnetoresistance parameters for spintronic applications. Next was **Vajiheh Alijani (Prof. Felser)** who explained the high energy photoemission of organic charge transfer films. The spin dependent transmission of electrons through a tunneling device was elaborated by **Dmytro Kutnyakhov (Prof. Elmers)**, before **Katerina Medjanik (Prof. Schönhense)** concluded the day with her talk about the evidence of charge transfer in UHV-deposited donor and acceptor sandwich layers.

The Sunday started with a sightseeing tour in the museum of rural life, where different typical old houses of all parts of the Ukraine are collected. Even some churches, which are still in use could be visited. The guides explained a lot of the typicial life of ukrainian people through the centuries and some traditional art crafts (e.g. easter eggs) were also exhibited.

The second scientific part started with the invited talk of **Olena Aksimentyeva (Prof. of Ivan Franko National University of Lviv)** who gave a broad introduction on conducting polymers and polymer-semiconductor hybrid systems. Next was **Chrisian Ohm (Prof. Zentel)** who presented a continous flow synthesis of microscopically structured actuators from liquid crystalline elastomers. Last but not least, **Peter Roth (Prof. Zentel)** pointed out how one can use an alpha, omega end group functionalized RAFT polymer to link different things starting from biomolecules and ending by dyes. The scientific part of the student seminar was concluded by the presentation of the MAINZ graduate school of excellence in general by the MAINZ coordinator **Mark Bajohrs**.

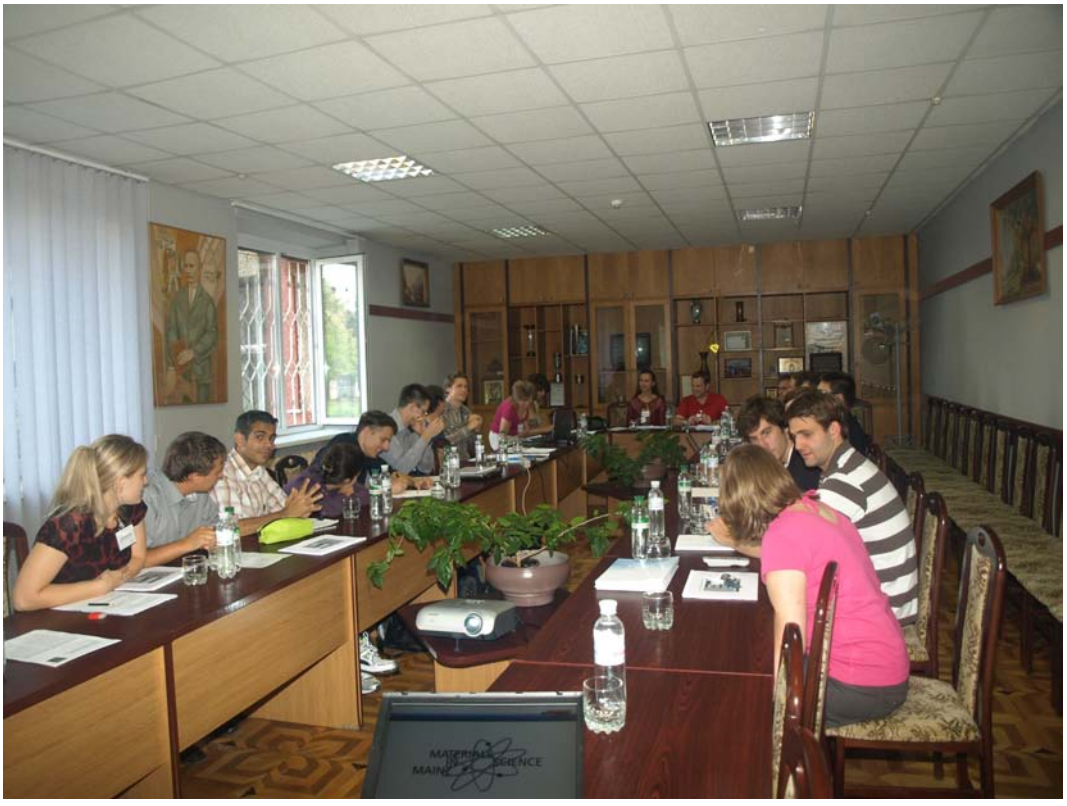

Figure 3: Discussion during the 4th MATCOR Student Seminar

The remaining part of the day was spend in the UNESCO World Heritage listed city center of Lviv, where again the highly encouraged guides explained different parts of the city. Especially the change of regimes during times was pointed out and their influence on the city architecture was shown. Even some more special things like the birth place of the founder of masochism, Leopold Ritter von Sacher-Masoch, could be visited. The highlight on the last day was the visit in the pharmacy museum of Lviv, where different rooms are open for the public. One room is even still in use as a real pharmacy. Other parts showed the storage or production of former medicine. Also the city hall and the central square were in the focus of this sightseeing tour. Unfortunately the panorama tower of the city hall was closed, so that an overall view of Lviv was not possible.

But nevertheless, the workshop provided again the possibility to get in touch with other PhD students this time not only of the University Mainz but also with participants from Ukraine. The atmosphere was relaxed, but very productive. All participants are looking forward to the next MATCOR Student Seminar in spring 2010.[1]

[1]Thanks to Yuriy Khalavka for providing all pictures presented here!