European CMetAC

ECMetAC Newsletter

January 2020 #1

Dear colleagues of the ECMetAC network,

Best wishes for 2020 from the Executive Board! On behalf of our Network, welcome to our first newsletter. It is our intention to send out the newsletter by e-mail a few times per year to update you on the Network activities and share other news and opportunities. In this issue we highlight our ECMetAC presentation award winners – our congratulations to them and many thanks to Magdalena Wencka for compiling these profiles!

If you have any news items for circulation, either on our website https://ecmetac.eu/ or in this newsletter, please send them to Ronan McGrath: mcgrath@liverpool.ac.uk with a cc. to Julian Ledieu: julian.ledieu@univ-lorraine.fr

Best wishes,

Julian Ledieu, Ronan McGrath, Marc Armbrüster, Jean-Pierre Celis and Émilie Gaudry

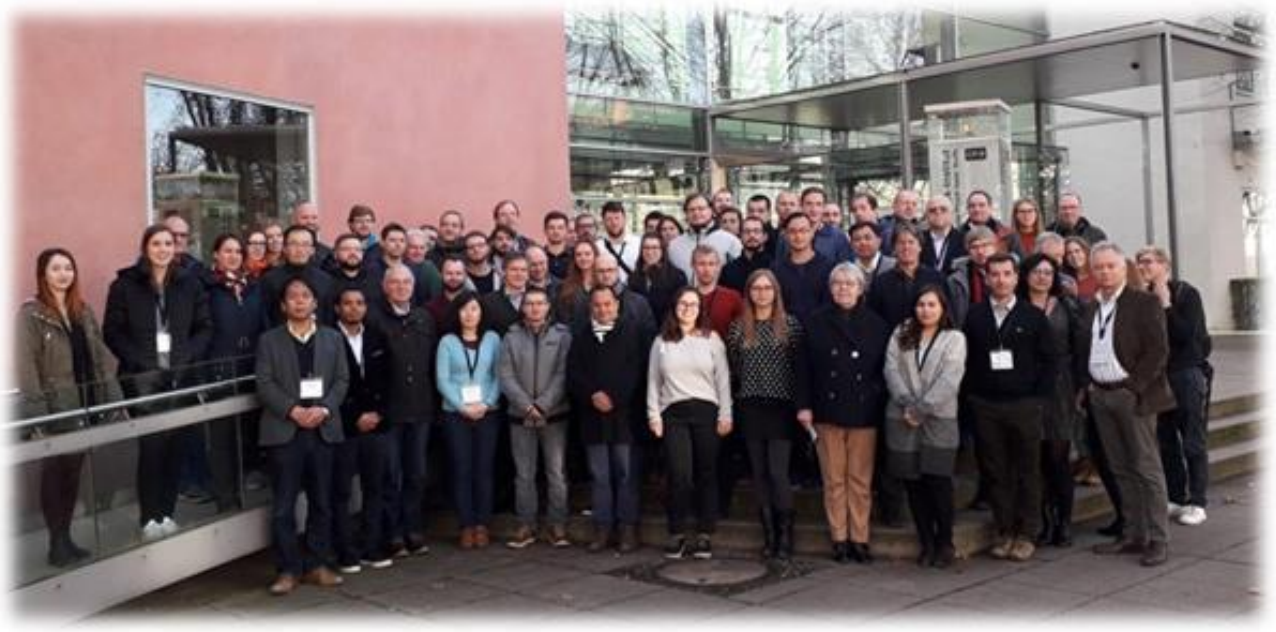
10th anniversary meeting of the European CMetAC Network

The 10th anniversary meeting of the European CMetAC Network (Centre for Metallic Alloys and Compounds) at the Max Planck Institute for the Chemistry and Physics of Solids in Dresden from 3-5 Dec.

Many thanks to Prof. Yuri Grin and his team at the Institute for their exemplary organisation of this very successful event!

Profiles of our young scientist awardees are given on the next pages.

https://www.cpfs.mpg.de/ecmetacdays2019



ECMetAC Young Scientists Oral Presentation Award: Darja Gačnik

Institute: J. Stefan Institute (Ljubljana, Slovenia)

Title of talk: Superconductivity in Ti-Zr-Hf-(Sn, Ni, Nb) HEAs

Darja Gačnik is in her 2nd year of PhD Physics program on Faculty of Mathematics and Physics, Ljubljana, Slovenia. Describing her "wow effect" in research that she presented in Dresden she said: "We discovered superconductivity in four high-entropy alloys: TiZrHf, TiZrHfSn, TiZrHfSnNb and TiZrHfSnNi. With the exception of TiZrHf sample, characterization revealed that they are multi-phase systems. Throughout our study, we tried to determine whether at low temperatures the samples represent superconducting-superconducting or superconducting-normal phase systems". What will be the crucial study of the next step? She said: "We are planning on further investigating superconductivity mechanisms in high-entropy alloys. I am especially enthusiastic about the critical current measurements that we will perform in future weeks, namely due to the possibility of good pinning of SC vortices. Further task that we want to achieve is to map the superconducting gap throughout the whole sample surface using STM. We would like to do so on one-phase superconducting HEAs, and with that determine the inhomogeneity effect on superconductivity, as well as on multi-phase SC-SC or SC-N HEAs. On general HEAs exhibit enhanced mechanical properties like high hardness and solid solution strengthening. Our next research focus will thus also be the investigation of mechanical properties of SC HEAs. We believe that due to the high specific strengths of high-entropy alloys they could be of use in the core of high-field magnet facilities, where SC materials should withstand high stress values".

Favourite hobby: Dancing. Currently she really into swing, especially boogie-woogie that has a rock-and-roll twist to original jazz style dancing. However, she has danced since she was little and enrolled almost in every type of dancing: from hip-hop to ballroom dances. "For me it is the only way I can truly experience the moment and not overthink every second of it" – Darja said.

ECMetAC Young Scientists Oral Presentation Award: Kristian Bader

Institute: Ludwig-Maximilians-Universität München (Munich, Germany)

Title of talk: "Single crystal growth of intermetallic solid solutions from the Ga-Pd-Sn system for basic research in heterogeneous catalysis".

Kristian Bader recently started 3rd year PhD. His general topic of the talk was dedicated to single crystal growth of the Ga-Pd-Sn system. He confessed: "I guess, the fascinating thing about these studies for me are the quite large single crystals and the very low growth rates of about one monolayer per second that we need to achieve such crystals. My next step will be investigating the high temperature regions of the Ga-Pd-Sn phase diagram".

Favourite hobby: skiing, hiking and biking in the mountains, since he can free his mind there.

ECMetAC Young Scientists Poster Award: Catalina Ruano Merchán

Institute: Institut Jean Lamour (Nancy, France)

Title of poster: Synthesis and characterisation of two-dimensional oxides quasicrystals on an ultrathin films stacking: preliminary results

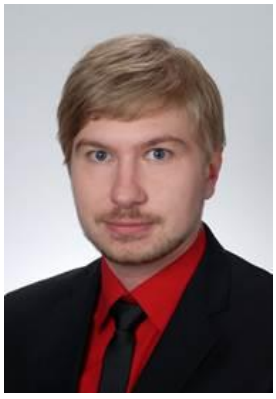
Catalina Ruano Merchán just started her 2nd year of PhD studies. Her delight in research presented in Dresden is as she says: “The opportunity to develop my project at one of the greatest experimental facilities in Europe known as "The Tube" is so far my biggest "wow experience". This equipment allows the connexion of 20 different chambers for the growth and in situ characterization of nanomaterials under ultra-high vacuum trough a 70 meters long tube! “ What will be the crucial study of her next step? Catalina says that “oxide quasicrystals are obtained by annealing above 1000K. Then, the next step is to reduce the oxide thickness to a couple of planes and perform an annealing under controlled conditions (pressure, temperature and time) to form the oxide QC”.

Privately Catalina really enjoys cooking. “Kitchen is my second lab! I like to experiment by creating new dishes that I can share with the people I love next to me”, she shared with us.

ECMetAC Young Scientists Poster Award: Przemysław Skokowski

Institute: Institute of Molecular Physics Polish Academy of Sciences (Poznań, Poland)

Title of poster: Physical Properties of the $Ce_{1-x}Pr_xCoGe_3$ system with suppression of magnetism.



Przemysław Skokowski is a 5th year PhD student. His “wow effect” of awarded presentation was mainly associated with the complementary presentation of the effect of substitution in the crystal structure of cerium magnetic ions with non-magnetic praseodymium without changing the electronic structure. The next steps concerning the results presented in Dresden will be connected with analysing the influence of the Crystalline Electric Field on the state of praseodymium, which can be examined by inelastic neutron scattering, and the effect of the substitution on the magnetic structure analysed with usage of the neutron diffraction study.

Favourite hobby: “In my free time I usually play online computer games because it allows me to relax while competing with other players”.

Upcoming events:

ECMetAC EuroSchool on "Intermetallic Compounds - Advanced Synthesis and Characterisation"

From 10th to 16th of May 2020 the yearly EuroSchool will take place in Chemnitz, Germany. The school is dedicated to advanced synthesis and characterisation methods of intermetallic compounds, comprising for example gas-phase transport reactions, single-crystal synthesis and reactive metal support interactions. A versatile set of characterisation methods will be taught, allowing a detailed analysis of intermetallic compounds. This covers on the one hand bulk analysis, such as XRD or SEM, and on the other hand different surface sensitive techniques, such as XPS. Besides these *ex situ* methods different *in situ* or *operando* approaches will be dealt with. Experimental characterization is complemented by modern quantum chemical calculations and their application. All lectures are accompanied by tutorials, allowing to practice the acquired knowledge.

Registration and additional information is available at http://www.mytuc.org/ES2020. Participation fees for one participant from each ECMetAC member will be paid by ECMetAC and due to funding of the school by the DAAD, travel grants for non-German students are available.

Network News:

Electrical Energy from Alcohol

The “NeMaCell“ ESF junior scientist research group is developing methanol fuel cells at Chemnitz University of Technology.

To generate climate-neutral electricity, for example for electromobility: a total of six professors from Chemnitz University of Technology are involved in the “New Materials for Fuel Cells” (NeMaCell) cooperative interdisciplinary project. The goal of the research team is to develop a fuel cell that can generate electricity from pure methanol. As methanol is a liquid and has similar transport properties as diesel and petrol, a vehicle with the appropriate technology could be refueled in a similar fashion to an automobile, and within a very short period of time.

Currently, methanol fuel cell technology is mainly used as a niche solution, for example within military context for energy generation in the field. As well, the application of methanol is more difficult than, for example, the H_2 fuel cell, as the use of methanol to generate electricity requires more complex catalysts, among other things.

For widespread use in the area of energy generation, further optimisation and an economic assessment of the technology are necessary. Both of these are a part of the NeMaCell project, and this should help contribute to the marketability of this groundbreaking future technology.

For more information, please visit the project website www.tu-chemnitz.de/nemacell

Marc Armbrüster