AC21-workshop: "Future perspectives on applications of porphyrin and phthalocyanine derivatives"

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Final Project Report

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Hosted and organized by

TECHNISCHE UNIVERSITÄT CHEMNITZ

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Scope of the workshop

Learning from nature we see that most beautiful and elegant are the simplest solutions. In this manner, nature found a variety of application opportunities for porphyrin molecules. Their importance for oxygen transport in blood (heme molecules) or for photosynthesis (chlorophyll) made these molecules interesting for potential technological applicability. The aesthetics of this molecular class resides in the flexibility of the synthesis of different porphyrin and phthalocyanine derivatives leading to distinct physical properties.

With the kind support from the "Special Project Fund" (SPF) of the Academic Consortium for the 21st Century (AC21), we organized a 2-day workshop in Chemnitz dedicated to the latest outcomes in the field of porphyrin and phthalocyanine chemistry and physics. This workshop was also intended to provide a platform for discussions regarding further innovative prospective applications. The workshop was organized by the Technische Universität Chemnitz (Germany) in cooperation with three other AC21 members, namely North Carolina State University (USA), Chulalongkorn University (Thailand), and University of Strasbourg (France). Besides the members of the AC21 Consortium, scientists from universities and other research institutions beyond the network (Imperial College London, Johannes Kepler University of Linz, University of Tübingen, TU Bergakademie Freiberg, Leibniz Institute for Solid State and Materials Research Dresden, as well as Klinikum Chemnitz) participated in the workshop.

Organization of the workshop

The meeting was prepared and hosted by the Technische Universität Chemnitz (TU Chemnitz) and chaired by Prof. Dr. Dr. h.c. Dietrich R. T. Zahn. The organizing committee included Prof. Dr. Georgeta Salvan, Dr. Jacek Gasiorowski, and Mrs. Jane Eisentraut from TU Chemnitz. The organizing committee was kindly supported by the International Office and by the Chancellor Office of TU Chemnitz. The tasks of the organizing committee comprised: the planning of the workshop scientific and social programme, the website creation, the preparation of information flyers and welcome packages for each participant, the planning of the accommodation for all participants, as well as the organization of the conference room and of the catering during the workshop according to the budget presented in SPF proposal. Details on the budget fulfillment are presented in the Financial Report.

Activities during the workshop

The workshop started on the 22nd of October 2015. After the opening speech by Prof. Dietrich R.T. Zahn who welcomed all participants, a welcome address was given by the Prorector for Knowledge and Technology Transfer of TU Chemnitz, Prof. Dr. Andreas Schubert, who emphasized the importance of this workshop for the further

enhancement of the international networking of as well as for the scientific reputation of the TU Chemnitz.

Group photo of the AC21 workshop participants, including TU Chemnitz representatives, in front of the conference hall.

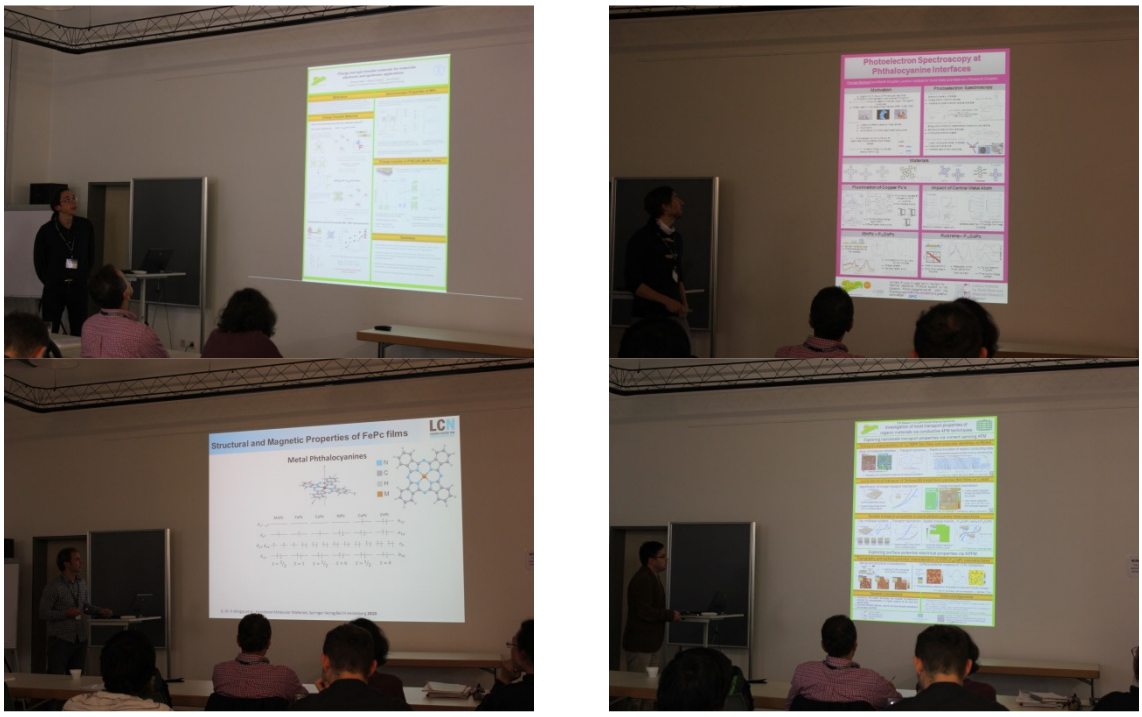
The opening lecture was given by one of the most recognized pioneers of the field of porphyrin and phthalocyanine research - Prof. Dr. Michael Hanack (University of Tübingen). He provided an overview of the greatest achievements in phthalocyanines research related to electronic applications and on the enhancement of their exceptional non-linear optical characteristics for optical and optoelectronic applications. The second lecture was given by Prof. Jonathan Lindsey from the North Carolina State University, who is a world class specialist in the porphyrins chemistry. His presentation was dedicated to the synthesis and application of tetrapyrrole macromolecules. The following talk given by Prof. Felix Castellano, also from the North Carolina State University, provided further insight in the photochemistry and non-linear optical properties of porphyrin derivatives and their possible bioinspired applicability.

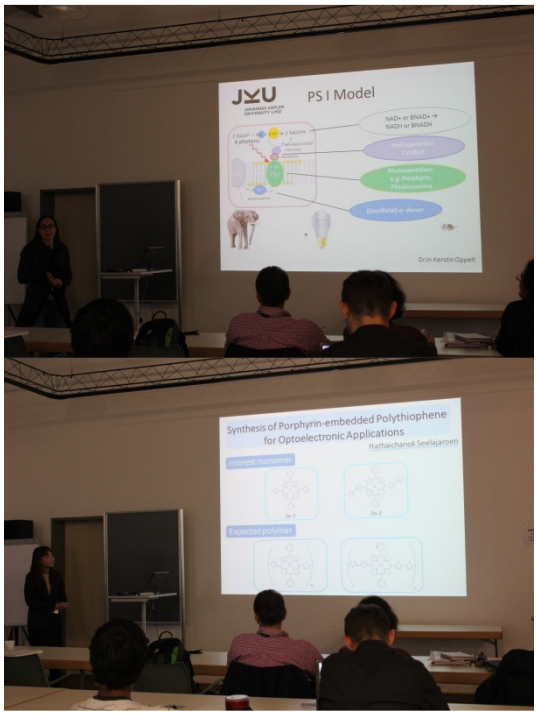
Speakers of the first session of the workshop

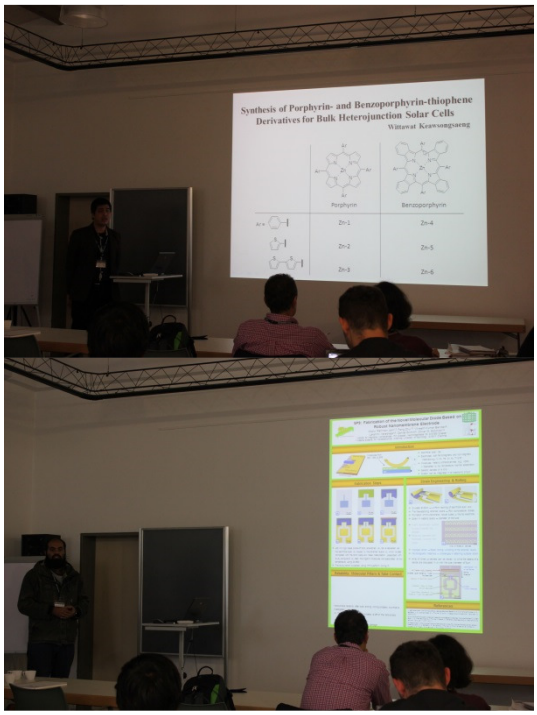
In the afternoon session Dr. Tobias Rüffer from the Inorganic Chemistry Department of TU Chemnitz presented state-of-the-art work regarding molecules synthesized and characterized in Chemnitz. The importance of metalloporphyrins for green chemistry, photocatalysis, and artificial photosynthesis was presented by Prof. Günther Knör from the Inorganic Chemistry Department, Johannes Kepler University in Linz, Austria. After this presentation, the participants had the chance to listen two presentations given by Dr Parichatr Vanalabhatana from Chulalongkorn University and Mr. Lars Smykalla from TU Chemnitz. Dr. Vanalabhatana talked about electrocatalytic aspects of different porphyrin derivatives. Mr. Lars Smykalla discussed chemical reactions of phthalocyanines and porphyrins on noble metal surfaces studied using scanning tunneling microscopy (STM).

Speakers of the second session of the workshop

The first workshop day ended with a 2 hours poster session. All presenting authors gave a three minutes presentation at the beginning of the poster session, advertising their posters. During the break before the poster session, some of the participants joined the guided tour through the chemistry laboratories at TU Chemnitz.







Photos taken during the short poster presentations

The workshop dinner gave all participants the possibility to discuss and get known each other in a friendly atmosphere. The dinner was a good occasion to celebrate the birthday of two participants - Prof. Dr. Michael Hanack and Prof. Dr. Patchanita Thamyongkit. After dinner, some of the participants joined the visit to a local brewery, where also scientific discussions continued.


Snapshots of the conference dinner.

The second day of the workshop started with the lecture by Prof. Dr. Sandrine Heutz from Imperial College in London (Great Britain) who presented the potential of phthalocyanines as building blocks for organic spintronics. The following lecture of Prof. Mario Ruben from University of Strasbourg gave even more insight in molecular quantum spintronics.

Snapshots from the second day of the workshop

After the coffee break, Prof. Dr. Patchanita Thamyongkit from Chulalongkorn University presented a lecture focused on the application of porphyrins in (photo)catalysis and organic optoelectronics. An insight into magneto-optoelectronics was given in the lecture by Prof. Dr. Georgeta Salvan from TU Chemnitz, who described magneto-optical properties of phthalocyanines and porphyrins. After the lunch break, during the last session of the workshop, lectures given by Prof. Dr. Jens Kortus from TU Bergakademie Freiberg, Dr. Paiboonvorachat from Chulalongkorn University, and Prof. Dr. Dietrich R.T. Zahn from TU Chemnitz followed. The theoretical description of metal phthalocyanines as potential materials for spintronics was the topic of a lecture given by Prof. Jens Kortus. Dr. Paiboonvorachat presented the calculated electronic structure of porphyrins obtained using a new HF-DMRG procedure. Prof. Dr. Dietrich R.T. Zahn discussed doping induced effects in thin films of manganese phthalocyanines using potassium as a dopant.The workshop was closed with a short session, during which the organizers, Prof. Dr. Dietrich Zahn, Prof. Dr. Georgeta Salvan, and Dr. Jacek Gasiorowski summarized the topics of the workshop and the outcomes of general discussions. During the general discussion, all participants agreed that the vivid discourses during the lectures, the poster session and the conference dinner have proven that young but also experienced scientists from different subject areas who normally do not meet each other in scientific conferences, have enjoyed the trans-disciplinarity of the workshop.

Final conclusions

The local organizers, Prof. Dr. Dietrich Zahn, Prof. Dr. Georgeta Salvan and Dr. Jacek Gasiorowski agree on the impression that the workshop, funded by the successful application of TU Chemnitz within a call for proposals of the “AC21 Special Project Fund”, was a great success – and that it motivates for further joint projects. Other participants from the AC21 member universities expressed their interest in organizing a follow-up workshop, including the intense involvement of scientists participating in the current workshop.