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Our Research Institutions at a glance: ETH Zürich

Located in Zurich, Switzerland, ETH Zurich (Swiss Federal Institute of Technology in Zurich) is one of the leading international universities for technology and natural sciences according to the academic rankings (consistently ranked among the top universities).

ETH Zurich was founded in 1855 with the stated mission to educate engineers and scientists. Today, it has more than 18,500 students from over 110 countries, including 4,000 doctoral students. To researchers, it offers an inspiring working environment, to students, a comprehensive education. Like every public university in Switzerland, ETH is obliged to grant admission to every Swiss resident who took the Matura. Applicants from foreign countries are required to take either the reduced entrance exam or the comprehensive entrance exam although some applicants from several European countries are exempted from this rule. An applicant can be admitted to ETH even without any verifiable educational records by passing the comprehensive entrance exam.

Education at ETH Zürich generally focuses more on theoretical aspects than application and most degree programs contain a high amount of mathematical training. The main language of instruction in undergraduate (Bachelor) studies is German and for admission a proof of sufficient knowledge of the German language is required for Bachelor students. Most Master's programmes and doctoral studies are in English.

ETH Zürich has two campuses. The main building was constructed in the 1860s in the heart of the city. As the university grew, it spread into the surrounding quarters. As a result, the Zentrum campus consists of various buildings and institutions throughout Zürich

and firmly integrates the ETH in the city. The main building stands directly across the street from the University of Zürich. Because this geographic situation substantially hindered the expansion of ETH, a new campus was built from 1964 to 1976 on the Hönggerberg in the outskirts of the city, also known as the Science City campus.



Figure 1. ETH Zurich main building (campus Zentrum).

ETH students were found to be the busiest students of all institutions of higher education in Switzerland. The undergraduates' tight curriculum consists of as much as twice the number of lectures as comparable courses of other Swiss universities. ETH has well over 100 student associations. The annual Polyball is the most prestigious public event at ETH, with a long tradition since the 1880s. The end of November, the Polyball welcomes around 10,000 dancers, music-lovers and party animals in the extensively decorated main building of ETH. The Polyball is the biggest decorated ball in Europe.

Twenty-one Nobel Laureates (including Albert Einstein) have studied, taught or conducted research at ETH Zurich, underlining the excellent reputation of the university.

New students in the network



Following with the recruitment process of the Mag(net)icFun network one new Ph.D. student will join our program by developing a six months research project at the ETHZ in Switzerland. Balder Rebmann is the third Ph.D. student from out-side of the network

who is taking up this opportunity.

Our new student: Balder Rebmann was born in Germany. He studied biology at the University of Freiburg and obtained his diploma in Synthetic Biology in December 2011. In January 2012 he started his Ph.D. studies at the University of Freiburg under the supervision of Prof. Wilfried Weber.

Balder's work is focused on the functionalization and application of nanoparticles in the biomedical field. Starting from January he will be spending 6 months in the group of Prof. Wendelin Stark at the ETH Zürich (Switzerland) where he wants to study the surface functionalization of magnetic nanoparticles for optimized behavior in biological systems.

Scientific achievements

PhD student Sharif Najafishirtari, (Italian Institute of Technology, IIT): Here at IIT, we have synthesized dumbbell like nanocomposites made by a metallic domain epitaxially connected to an iron oxide domain. The work was initially focused on Au/iron oxide heterostructures. Nanoparticles (NPs) with various sizes of Au domain (nominally 3, 6 and 12 nm) and with iron oxide nanoparticles of 18 nm were obtained. A seeded growth method was employed to develop the iron oxide domain on pre-formed Au nanoparticles. These nanostructures were further deposited on alumina supports and their catalytic activity and thermal stability were evaluated in the oxidation of CO. For comparison purposes, Au and iron oxide nanoparticles were also separately deposited on alumina and tested in the same reaction. Catalyst made of dumbbell nanoparticles of 6 nm Au and iron oxide showed the highest activity in the studied reaction. These results were presented in a conference ICEC 2014 and a manuscript is under preparation.

The seeded growth approach was successfully extended

from Au to AuCu NPs seeds. Dumbbell like nanocomposites made by an intermetallic alloy of Au and Cu (50:50 atomic ratio) were synthesized and the size of the metallic domain was kept constant at ~6 nm. Then, the immobilization of the dumbbell like nanoparticles onto an alumina matrix was performed and the catalytic activity of the obtained materials was evaluated in the oxidation of CO. A different catalytic behavior of the synthesized material was observed depending of the pretreatment performed. While an oxidizing pretreatment supposed a poor catalytic activity of the solid because of the phase segregation between Au and Cu, an enhancement of the activity was observed after reducing treatment, which was attributed to the intimate contact between Au and Cu in the nanostructured material. The results derived from this work have been published in ACS Catal.

[1] Najafishirtari, S.; Brescia, R.; Guardia, P.; Marras, S.; Manna, L.; Colombo, M. *ACS Catal.* 2015, 5, 2154-2163.

Outreach activities

* **Symposium about 'Magnetic Nanoparticles' at the ACS conference Boston, August 2015:** next Monday 17th of August will take place the symposium called 'Magnetic Nanoparticles' at the 250th American Chemical Society National Meeting and Exposition held in Boston (Massachusetts). This symposium has been organized by two of the PIs of our Mag(net)icFun network, Prof. Oliver Reiser (University of Regensburg, UREG) and Prof. Miquel Pericàs (Institute of Chemical Research of Catalonia, ICIQ). The symposium has been allocated in the division of organic chemistry and some of our students will take part of it by presenting the last results of their research projects. Nevertheless, because of the multidisciplinary environment of the Mag(net)icFun network student's and PI's research will be also presented in other divisions:

- o **division of organic chemistry, session 'Nanomaterials':** Francesca Besostri (UREG), Soraia Fernandes (UREG), Vladimir Zlateski (ETHZ), Silvia Panzeri (UREG), Kaarjel Narayanasamy (Keele University, UKEE), Corina Eichenseer (ICIQ), Sara Ranjbar (ICIQ),

Raquel Serrano (Trinity College Dublin, TCD), Eva Luther (Nanotherics, NANO)

- o **division of inorganic chemistry, session 'DNA, RNA and inorganic drugs':** Michela Puddu (ETHZ)
- o **division of colloid and surface chemistry, session 'nanotheranostics for cancer applications':** Dalibor Soukup (UKEE)
- o **division of agricultural and food chemistry general papers:** Michela Puddu (ETHZ)
- o **division of small chemical businesses: starting-up & spinning-out commercializing innovative chemistry:** Dr. Robert Grass (TURBOBEADS)
- o **division of environmental chemistry: environmental transformation of nanoparticles: processes, mechanisms, and ecological impacts:** Dr. Robert Grass (TURBOBEADS)

* **Our PhD student Michela Puddu was placed 4th in the business-plan competition 'Venture Ideas',** which consists

of a business idea competition and a business plan competition promoted by the ETH Zürich, CTI, Knecht Holding and McKinsey & Company, Switzerland. In this year edition, 107 participants have submitted their business ideas and 95 their business plans. Our PhD student Michela Puddu participated with the project 'Sensatag' and was awarded with the 4th price of the competition together with other 5 finalists, see more information in the following link:

<http://www.fml.ethz.ch/news-and-events/fml-news/2015/06/4th-place-for-sensatag-at-venture-idea-competition-2015.html> 

* **Corina Eichenseer together with Prof. Oliver Reiser (UREG) have published an article in the 'News magazine of the German Chemical Society'** in which research activities of the network are highlighted:

[ref] C. M. Eichenseer, O. Reiser, 'Magnetisch, nano, funktionalisiert', *Nachr. Chem.* 2015, **63**, 763-767.

News from the network

- The cotutelle programme envisioned in the grant agreement of the Mag(net)icFun project has commenced. Students enrolled in this programme will obtain a dual degree because of developing their research activity in two different Universities/Institutes for more than 6 months each. The University of Regensburg (UREG), the Institute of Chemical Research of Catalonia (ICIQ) and at the Italian Institute of Technology (IIT) are the three partners involved in this programme. Thus, the already started secondments are organized as follows:

	Primary Host	Secondary Host	Dates of secondment
Francesca Besostri	UREG	ICIQ	April 1 st 2015 - January 31 st 2016
Soraia Fernandes	UREG	IIT	April 1 st 2015 - January 31 st 2016
Dina Niculaes	IIT	ICIQ	April 1 st 2015 - January 31 st 2016
Sara Ranjbar	ICIQ	UREG	July 1 st 2015 - March 31 st 2016

- Fellows publications of the network: <http://www.magneticfun.eu/publication.php>

➤ **R. Grass, R. Heckel, M. Puddu, D. Paunescu, W. J. Stark**, 'Robust Chemical Preservation of Digital Information on DNA in Silica Using Error Correcting Codes', *Angew. Chem. Int. Ed.* 2015, **54**, 2552. **FRONT COVER.**

➤ **M. Puddu, W.J. Stark, R. Grass**, 'Silica microcapsules for long-term, robust and reliable room temperature RNA preservation', *Adv. Healthcare Mater.* 2015, **4**, 1332. **INSIDE COVER.**



➤ **H. Kakwere, M. Pernia Leal, M. E. Materia, A. Curcio, P. Guardia, D. Niculaes, R. Marotta, A. Falqui, T. Pellegrino**, 'Functionalization of Strongly Interacting Magnetic Nanocubes with (Thermo)Responsive Coating and Their Application in Hyperthermia and Heat-Triggered Drug Delivery', *ACS Appl. Mater. Interfaces*, 2015, **7**, 10132.

➤ **S. Najafshirtari, R. Brescia, P. Guardia, S. Marras, L. Manna, M. Colombo**, 'Nanoscale Transformations of Alumina-Supported AuCu Ordered Phase Nanocrystals and Their Activity in CO Oxidation', *ACS Catal.* 2015, **5**, 2154.

➤ **S. Fernandes, C.M. Eichenseer, P. Kreitmeier, J. Rewitzer, V. Zlateski, R.N. Grass, W.J. Stark, O. Reiser**, 'Reversible magnetic mercury extraction from water', *RSC Adv.* 2015, **5**, 46430.

<ul style="list-style-type: none"> NEWSLETTER EDITOR: Adela I. Carrillo Gómez PROJECT DURATION: October 1, 2012-September 30, 2016 COORDINATOR: Adela I. Carrillo Gómez/Oliver Reiser 	<ul style="list-style-type: none"> PROJECT REFERENCE: 290248 SUBPROGRAMME AREA: FP7-PEOPLE-2011-ITN CONTRACT TYPE: Networks for Initial Training (ITN)
Universität Regensburg, Universitätsstr. 31, 93053 Regensburg, Germany	