Young Career Focus: Professor David Díaz Díaz (University of Regensburg, Germany)

Background and Purpose. ***SYNFORM*** will from time to time meet young up-and-coming researchers who are performing exceptionally well in the arena of organic chemistry and related fields of research, in order to introduce them to the readership. This ***SYNSTORY*** with a Young Career Focus presents Professor David Díaz Díaz (University of Regensburg, Germany).

BIOGRAPHICAL SKETCH

Prof. D. Díaz Díaz

David Díaz Díaz was born in Tenerife (Spain) in 1974. He obtained his B.Sc. in chemistry at the University of La Laguna (ULL), Tenerife, in 1997. He then continued his studies at the University Institute for Bio-Organic Chemistry 'Antonio González' (IUBO, ULL), conducting his Ph.D. under the supervision of Professor Víctor Martín García, where he worked on the use of acetylene complexes with Co2(CO)8 in the development of new methodologies for the stereocontrolled synthesis of natural products. After completing his Ph.D. in 2002, he joined Professor M. G. Finn's research group at The Scripps Research Institute (San Diego, USA) for a postdoctoral stay, where he also worked with Professors K. Barry Sharpless and V. V. Fokin. The focus of his work was on the chemistry of amidines and on the application of click chemistry to materials synthesis. In 2006, he was appointed as a 'Ramón y Cajal' researcher at the Autonomous University of Madrid (Spain). One year later, he joined The Dow Chemical Company (Switzerland) and in 2009 he was appointed as a Tenured Scientist of The Spanish National Research Council (CSIC). In 2010, he received the Alexander von Humboldt Fellowship for Experienced Researchers and established a research group at the University of Regensburg (Germany). In 2013, he became a permanent Scientist of the Institute of Advanced Chemistry of Catalonia (IQAC-CSIC, Barcelona, Spain) and was awarded with the prestigious DFG Heisenberg Professorship in Germany. Among different awards, he was finalist of the European Young Chemist Award in 2008, and he is also the Editor of the Journal of Physical and Chemicals Gels. He is currently W2 Professor at the University of Regensburg (Germany) and carries out his teaching and research activities through a bilateral agreement between IQAC-CSIC and this university.

INTERVIEW

SYNFORM | *What is the focus of your current research activity?*

Prof. David Díaz Díaz | My research focuses on the development and studies of soft functional materials for biomedical, catalysis, sensing, coatings and energy applications. In terms of the type of materials, my major interests are in chemical and physical (supramolecular) gels, adhesives, biopolymer-based materials, and organic–inorganic hybrids. The research in all these areas is highly interdisciplinary and involves a great deal of synthesis, characterization and isolation of organic compounds, as well as a deep knowledge of the core of materials science.

SYNFORM | *When did you get interested in synthesis?*

Prof. David Díaz Díaz | I have been interested in organic synthesis ever since my first course in chemistry as an undergraduate student. I have always been captivated by the association between any process occurring in nature and different chemical reactions, but even more by the fact that a chemist could learn how to make molecular connections and access a large number of new structures. Organic synthesis would give me the opportunity to understand the mechanisms behind molecular connectivity, and therefore chemical properties. During my Ph.D. studies, I worked with a plethora of synthetic methods, reaction conditions, and retro-synthetic analyses that gave me the training and a valuable perspective that I needed later to pursue a fascinating journey from organic synthesis to materials science.

SYNFORM | *What do you think about the modern role and prospects of organic synthesis?*

Prof. David Díaz Díaz | In my opinion, the need for more sustainable and orthogonal chemical processes will continue to drive the evolution of modern organic synthesis with the aim of transforming substances to enhance the quality of life. Despite the major advances in catalysis and high-throughput experimentation, organic synthesis still has vast areas to be optimized (e.g., flow chemistry, 'green' aspects,

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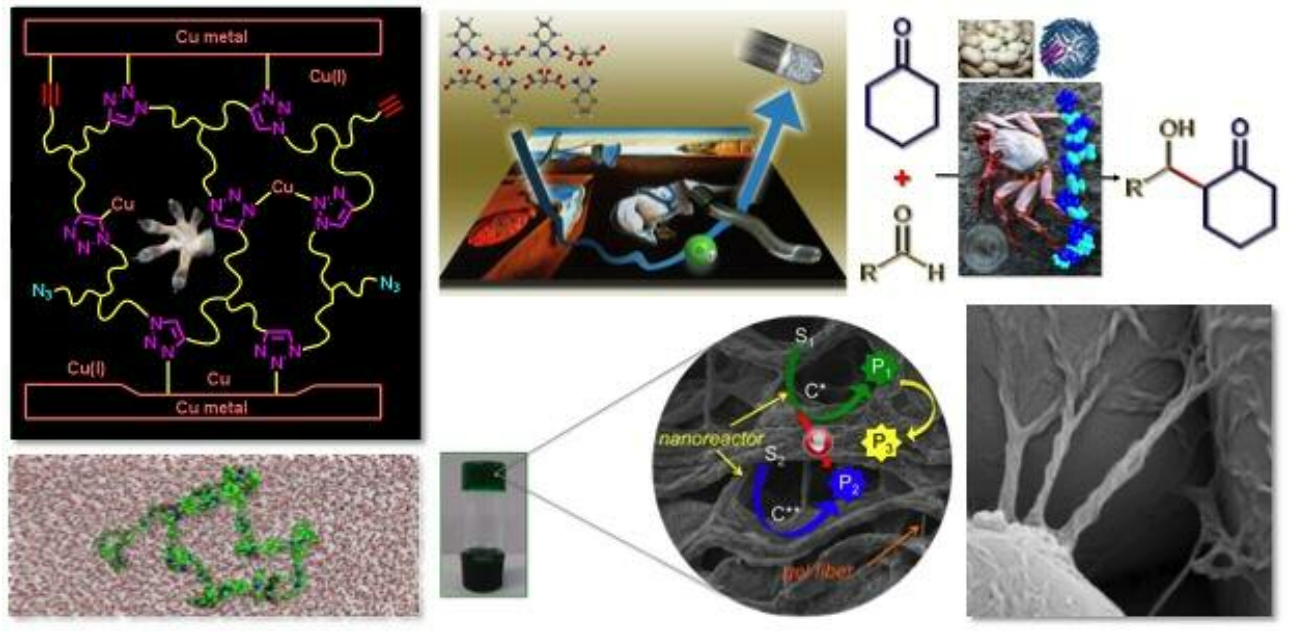
automation). Nowadays, organic synthesis is a powerful tool for the development of multifunctional and multiresponsive materials for numerous high-tech applications. Thus, I envision the development of new synthetic methods to fulfil the requirements defined by sustainable and large-scale industrial productions. In other words, process research will establish the major criteria for the selection of appropriate synthetic methods or for the development of new ones.

SYNFORM | *Your research group is active in the area of organic chemistry, catalysis and materials science. Could you tell us more about your research and its aims?*

Prof. David Díaz Díaz | Among my research goals, I seek to better understand the gelation phenomenon (which involves the elusive equilibrium between gelation and crystallization) and chemical reactivities inside polymer and gel networks; to evaluate the intrinsic catalytic activity of biopolymer- and protein-based materials in different physical states; to develop conductive and sustainable adhesive polymers; and to develop new strategies for improving the stability and functionality of hybrid organic–inorganic materials. One of the aims of my research is to develop gel-based nano- and microreactors that could enhance the selectivity of chemical transformations and/or activate new reaction pathways. Moreover, I also have a particular interest in the preparation of gel-based materials with autonomous self-healing and load-bearing properties, as well as on the use of natural polymers and proteins for the better understanding of their role in evolution and for the development of 'greener' catalysts. In general, I am convinced that the discovery of new versatile and functional materials with a solid prospect for practical applications is intimately associated with inexpensive, simple, sustainable and scalable processes. Thus, I am always looking for the selection of the most practical chemical approaches in order to synthesize new materials, fine-tuning specific properties, and creating new functions. In this sense, and inspired by Kelly Johnson, I would like to coin and spread the 'KISSu' principle (**K**eep **I**t **S**imple and **S**ustainable) in modern materials synthesis.

SYNFORM | *What is your most important scientific achievement to date and why?*

Prof. David Díaz Díaz | During my scientific trajectory I have been immersed in different research fields, trying to understand some of the most important channels that interconnect different disciplines. In this sense, some of the most relevant contributions that I have achieved with my coworkers are the result of this career path that I decided to follow. For instance, the discovery of the 1,3-chirality transfer during the Nicholas reaction, which permitted the development of a robust methodology to access to trialkyl-substituted stereogenic carbons, or the first practical and modular



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synthesis of highly versatile formamidine ureas, represent important achievements in the field of organic synthesis. On the other hand, the pioneering application of click chemistry for the synthesis of superior gel networks and metal adhesive polymers constitute seminal contributions for the use of this chemistry in the field of materials synthesis. More recently, the isolation of transient gel phases, the preparation of supramolecular self-healing metallogel networks, the development of a synergistic computational–experimental approach to improve the gelation ability of ionenes, and the demonstration of the link between physical state and catalytic activity of biopolymers and proteins, represent major achievements in the interface of different research areas.

Matteo Zanda

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