Young Career Focus: Dr. Georg Manolikakes (Goethe-Universität Frankfurt, Germany)

Background and Purpose. SYNFORM regularly meets 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 Young Career Focus presents Dr. Georg Manolikakes (Goethe-Universität Frankfurt, Germany).

Biographical Sketch

Dr. G. Manolikakes

Georg Manolikakes was born and raised in Ebersberg (Germany). He studied chemistry at the Ludwig-Maximilians-Universität München (Germany). He received his Diploma (2005) and PhD (2009) from the same university under the guidance of Professor Paul Knochel in the field of functionalized organometallics. In 2009, Georg joined the group of Professor Phil S. Baran at the Scripps Research Institute in La Jolla, CA (USA) as a postdoctoral fellow, where he worked on the total synthesis of cortistatin A, a marine natural product. Since October 2010 Georg is an independent research group leader at the Goethe-Universität Frankfurt (Germany). His research interests focus on the development of new methods for the synthesis of biologically relevant molecules with particular emphasis on multicomponent reactions. His work has been recognized by a number of awards and fellowships, among them the Thieme Chemistry Journals Award (2016), the Dr. Otto-Röhm Memorial Foundation Award (2016), an Exploration Grant from the Boehringer Ingelheim Foundation (2016) and a Liebig Fellowship from the Fonds der Chemischen Industrie (2011).

INTERVIEW

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

Dr. G. Manolikakes The central theme in my research group is the development of new, efficient and highly modular methods for the construction of complex organic molecules from relatively simple starting materials. Our fundamental approach can be considered as a functional group based approach. We start with the identification of specific functional groups or structural motifs, which are prevalent in biologically active compounds. Then we look for novel, more efficient, sustainable or perhaps still undiscovered methods for the construction of these substructures. Our current research can be divided into two major areas: (i) the development of sulfur dioxide based three-component reactions for the synthesis of sulfones and sulfonamides; and (ii) new methods for the sustainable and stereoselective construction of amines and α-amino acids.

SYNFORM *When did you get interested in synthesis?*

Dr. G. Manolikakes My interest in chemistry started in high school. In the last two years of high school I had the opportunity to spend some time in the school lab and conduct my first own, very small but still independent research project. In the course of this project I became fascinated by the combination of theoretical knowledge and practical application of this knowledge in an experiment as well as the reverse process, the generation of new knowledge through well-planned and well-executed experiments. During my chemistry studies I got more and more interested in organic synthesis, its creative power to build very complex molecules and the underlying logic based solely on molecular reactivity. To date I am thrilled by the fact that we can purposefully design and synthesize so far unknown molecules with distinct properties starting from

© Georg Thieme Verlag Stuttgart • New York – Synform **2017/03**, A53–A55 • Published online: February 15, 2017 • DOI: 10.1055/s-0036-1590053

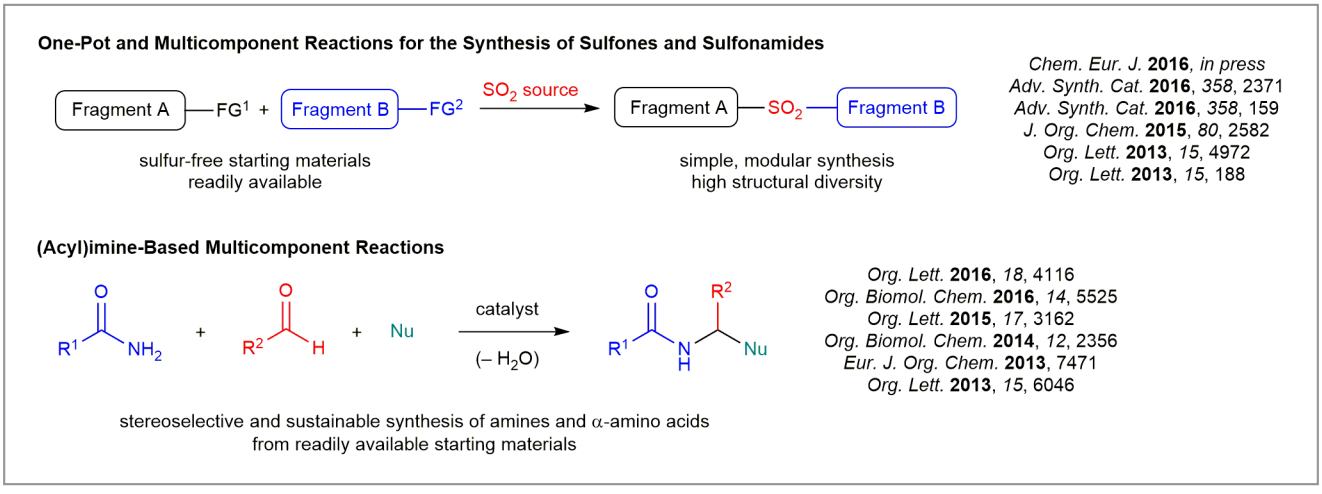
some sketches on a plain paper (or on an empty space in a conference program or a paper tissue).

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

Dr. G. Manolikakes Although organic synthesis has seen tremendous developments over the last 100 years, its main purpose is still the same: the synthesis of organic compounds for all aspects of human life. We should always keep in mind that we as synthetic chemists are creative scientists with the unique ability to interconvert simple matter into molecules that matter for humanity. I believe that organic synthesis today is facing two major challenges (or rather opportunities): how we synthesize molecules and the synthesis of new molecules for new applications. The development and implementation of more sustainable processes and the utilization of renewable raw materials should (and will) be a major focus in modern organic synthesis. At the same time, we have to use our ability to create new molecules with new functions to meet the ever-changing needs of society. The second task can only be addressed in collaborative projects with other scientists from all other disciplines, such as biology, physics or medicine. Synthetic chemists and their knowledge of how to design and control function at the molecular level are central to these multidisciplinary research projects.

SYNFORM *Your research group is active in the area of organic synthesis, especially using organometallic reagents. Could you tell us more about your research and its aims?*

Dr. G. Manolikakes Our main focus is the developments of new methods for the efficient and modular synthesis of specific substructures and not a certain type of methodology. Anything or rather any method goes, as long as we reach our fundamental goals. However, we rarely meet our final objectives in one step. In general, this is an iterative process. Our recent developments of one-pot reactions for the synthesis of sulfones with sulfur dioxide as key building block are a good example. We started indeed with organometallic reagents, partially due to my strong background in this area. But after the establishment of certain reactivity profiles, we moved on to incorporate the direct functionalization of C–H bonds in order to develop more sustainable approaches. And we will continue to devise more efficient methods until we reach our final goal, a completely sustainable and highly modular synthesis of sulfones and sulfonamides. In the same manner we could develop new methods either for a sustainable or for a stereoselective synthesis of amines and α-amino acids. Now we have to merge both developments to reach a green and stereoselective synthesis. In addition, we are starting to explore the application of our methods for the preparation of molecules with distinct properties for multidisciplinary research projects in medicine and materials science. My co-workers and I are very happy to see that some of our compounds show very promising biological activities.



Scheme 1 Overview of research projects in the Manolikakes group

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

Dr. G. Manolikakes Given that I still stand at the beginning of my career, I hope my most significant achievements still lie in the future. Nonetheless, I believe that with our contributions in the fields of sulfur dioxide chemistry and amine synthesis, many of them highlighted in *Synfacts* or *Org. Process Res. Dev.*, we are well on track towards our ultimate goal, universal tools for the sustainable synthesis of complex molecules containing either a sulfonyl or an amine moiety. However, we are only at the beginning of this process. My biggest hope is that one day at least one of my methods will be used for the synthesis of a molecule that will benefit society as a whole.

© Georg Thieme Verlag Stuttgart • New York – Synform **2017/03**, A53–A55 • Published online: February 15, 2017 • DOI: 10.1055/s-0036-1590053