Young Career Focus: Dr. Subhas Chandra Pan (Indian Institute of Technology Guwahati, India)

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. Subhas Chandra Pan (Indian Institute of Technology Guwahati, India).

Biographical Sketch

Dr. S. C. Pan

Subhas Chandra Pan was born in 1980 in West Bengal (India). He obtained his BSc degree with honours in chemistry from the University of Calcutta (India) in 2001 and stood first in chemistry honours. Then he received his MSc degree in 2004 from the Indian Institute of Science, Bangalore (India), achieving the highest mark of the year for chemistry. During his MSc thesis he worked in Prof. Goverdhan Mehta's laboratory on the total synthesis of epoxyquinone natural products and successfully synthesized the natural products jesterone, torreyanic acid, ambuic acid and yanuthone A. He obtained his PhD in 2008 summa cum laude under the guidance of Prof. Benjamin List at the Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr (Germany). During his PhD, he developed a novel variant of the Strecker reaction, namely the asymmetric acylcyanation of imines using chiral thiourea catalysts. He also discovered a catalytic three-component Ugi reaction using phenyl phosphinic acid as the catalyst. Then he began postdoctoral work at Harvard University (USA) in the group of Prof. E. J. Corey, where he focused on the catalytic asymmetric Kulinkovich reaction. Consequently, in 2009 he carried out his second postdoctoral study at the Scripps Research Institute, Florida (USA) with Prof. Glenn C. Micalizio and conducted research on the synthesis of gepotidacin analogues. In 2011, he joined the Indian Institute of Technology Guwahati (India) as assistant professor and was promoted to associate professor in 2015. His research interests comprise metal and organocatalytic diastereo- and enantioselective reactions and natural products synthesis. He received the DAE Young Scientist Research Award in 2012 and a Thieme Chemistry Journal Award in 2018.

INTERVIEW

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

Dr. Pan During my PhD studies, I became fascinated with asymmetric organocatalysis, which has established itself as a powerful method for the synthesis of chiral molecules. My independent research is focused mainly on the convenient catalytic asymmetric syntheses of different carbocyclic and heterocyclic frameworks. We are also interested in the synthesis of natural products and other bioactive molecules utilizing our methodology.

SYNFORM *When did you get interested in synthesis?*

Dr. Pan I became interested in organic synthesis during my undergraduate studies at Ramakrishna Mission Vidyamandira, Belur Math under the University of Calcutta. In my college days, I was taught by excellent organic chemistry teachers and solving organic chemistry problems was enjoyable. Then in my Master's studies at the Indian Institute of Science, Bangalore, I was fortunate to work on total synthesis of natural products under the guidance of Prof. Goverdhan Mehta. During this period, I became confident in performing organic reactions on the bench and thinking about organic research problems. During my PhD, I worked on asymmetric organocatalysis and became really interested in constructing chiral organic molecules.

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

Dr. Pan Organic synthesis is a fundamental and eternal science for the development of medicines, materials, cosmetics, and fragrances, among others. One of the major challenges in organic synthesis from the environmental point of view is

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to generate less waste, or even no waste at all. Thus, atom- and step-economic approaches should be developed for the synthesis of a particular molecule. Catalytic domino or cascade reactions have emerged as powerful approaches for the synthesis of complex molecular frameworks in a single step. Another challenge is to prepare different enantiomers or diastereomers of a product from a single starting material. In this case, stereodivergent catalysis is a dominant method for the synthesis of a library of stereoisomers.

SYNFORM *Your research group is active in the area of asymmetric synthesis and natural product synthesis. Could you tell us more about your research and its aims?*

Dr. Pan One major focus of our research is to prepare bioactive privileged cyclic structural motifs via an asymmetric organocatalytic domino strategy. We have employed bidentate reactants for this purpose. In recent years we have developed convenient syntheses of multi-substituted tetrahydrofurans, tetrahydropyrans, pyrrolidines, imidazolidines, coumarins, pyrazolones, etc. We have also explored α-nitro ketones as nitro-containing acyl transfer reactants. A range of bidentate substrates such as unsaturated pyrazolones, γ-hydroxyenones and 2-hydroxycinnamaldehydes were engaged in the reaction with α-nitro ketones. Also, in a few cases, we have carried out theoretical investigations to understand the detailed mechanism. We would like to apply our methodology in natural products synthesis in the near future.

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

Dr. Pan This is a tough question and difficult to choose a particular accomplishment. At the beginning of my career, we developed an organocatalytic redox isomerization of electron-deficient alcohols, which was accepted as an abstract in organic chemistry portal. Later, we explored α-nitro ketones in a range of asymmetric transformations. We found that the higher reactivity of α-nitro ketones relative to nitroalkanes is beneficial for undergoing challenging conjugate addition reactions. Lastly, I would like to thank my co-workers for their enthusiasm, hard work and dedication, and funding agencies for their support.

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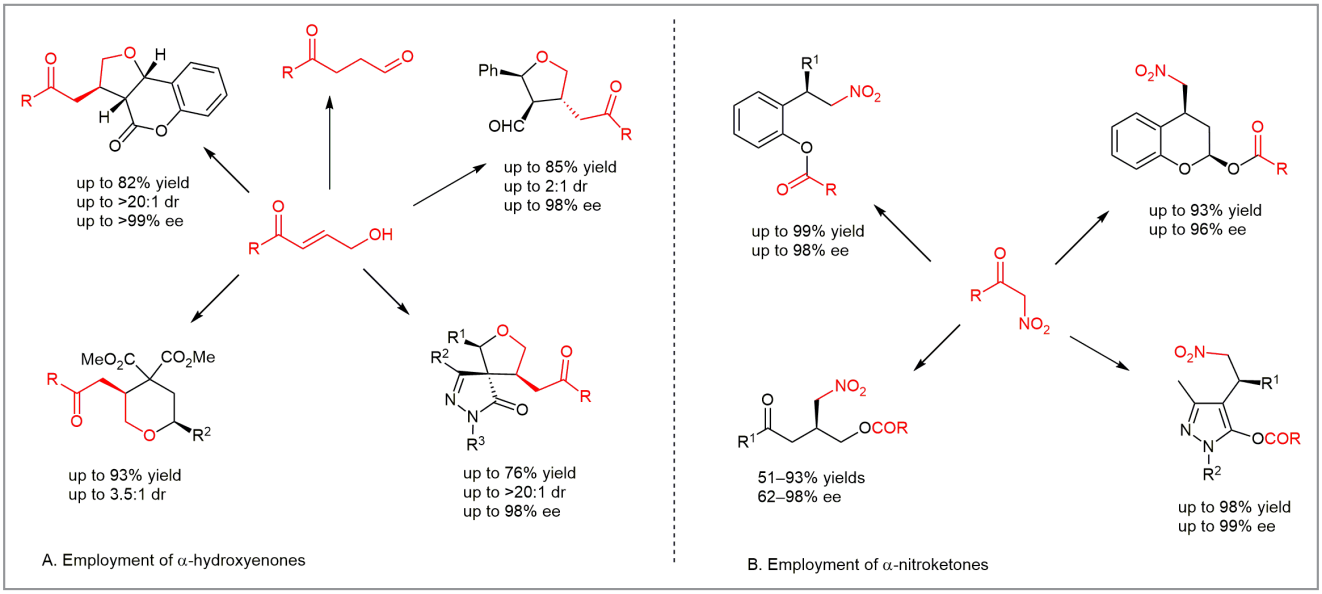

Scheme 1

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