

Young Career Focus: Professor Moisés Gulías (Universidade de Santiago de Compostela, Spain)

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 Professor Moisés Gulías (Universidade de Santiago de Compostela, Spain).

Biographical Sketch



Prof. M. Gulías

Moisés Gulías was raised in Pontevedra, Galicia, a small town located on the northwest coast of Spain. He studied chemistry at the Universidade de Santiago de Compostela (Spain), where he also obtained his PhD in 2006 under the supervision of Professor Mascareñas. During his PhD he completed a pre-doctoral stay at Stanford University (USA) with Professor Barry Trost. He was a Marie-Curie postdoctoral fellow during 2007–2009 in the research group of Professor Matthew J. Gaunt at the University of Cambridge (UK). In 2010, he obtained a Parga Pondal position at the Universidade de Santiago de Compostela and in 2016 he was promoted to Assistant Professor. He has received the Sigma-Aldrich prize by the Spanish Royal Society of Chemistry (RSEQ) and the Thieme Chemistry Journals Award in 2015. For details about his independent research, please see: <http://gulias-group.com/>.

INTERVIEW

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

Prof. M. Gulías Enhancing the efficiency of assembling relatively complex organic products from simple and non-expensive precursors constitutes one of the most exciting challenges for a synthetic chemist. Within this objective, our research program is dedicated to the development of new metal-catalyzed reactions involving the activation of C–H bonds that result in rapid increases in molecular and/or stereochemical complexity and match the requirements of atom economy, selectivity and minimization of chemical waste.

SYNFORM *When did you get interested in synthesis?*

Prof. M. Gulías I have been always very passionate about learning new things, which causes me to have a wide range of interests. Science has always interested me, and chemistry in particular was my favorite subject as far back as I can remember. I really liked how chemistry allowed scientists to become molecular architects, so I chose to study chemistry at university. Later, I became fascinated by the ability of metal complexes to carry out unique transformations, so I pursued my PhD in this field.

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

Prof. M. Gulías Organic synthesis remains central to the advancement of science and improvements in quality of life since it provides an ideal platform for progress in other sciences and for fostering new technological applications. On one hand, organic synthesis plays an important role in the progress of many other areas of science such as biochemistry, medicine, materials science, agriculture, petrol chemistry...

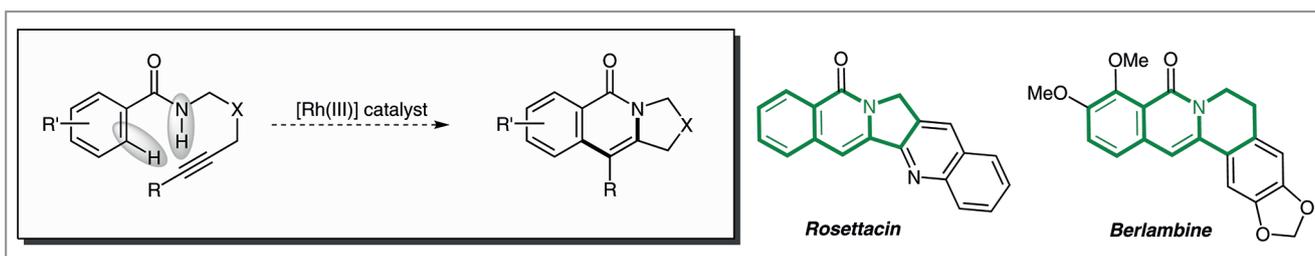
and I think this connection of organic chemistry with the other sciences is a trend that will be increasing in the future. On the other hand, the role of organic synthesis remains the same as always, as a tool for constructing designed molecular structures that modify biological processes and provide new therapeutic opportunities. This is of vital importance since it is among those scientific activities that organic synthesis can have major long-term benefits for humanity.

SYNFORM *Your research group is active in the field of metal catalysis. Could you tell us more about your research and its aims?*

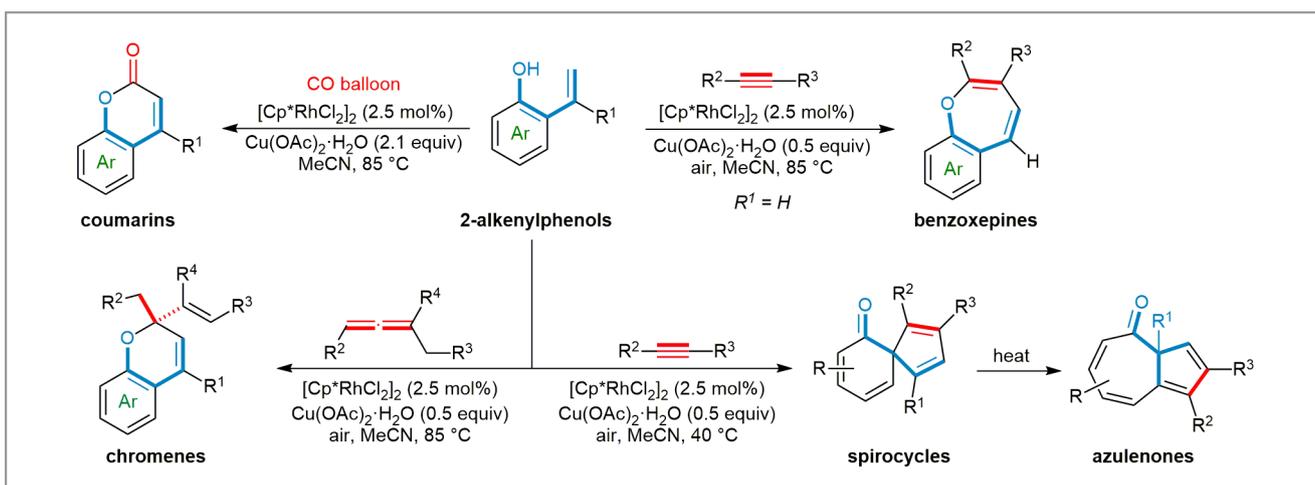
Prof. M. Gulías As I have mentioned before, we seek to transform simple molecules into complex products by the functionalization of C–H bonds with metal catalysts. While most of the C–H functionalization is related to cross-coupling transformations, our group works in the development of new types of cycloadditions which involve the cleavage of C–H bonds in order to form cyclic systems from otherwise unreactive acyclic precursors.

For instance, we have shown how benzamides can react intramolecularly with alkynes, leading to the formation of tricyclic isoquinolinic structures which form the core of many bioactive molecules (see Scheme 1).¹ We also have shown how 2-alkenylphenols – which are prepared in one step from commercially available compounds – can be transformed into a variety of interesting cyclic structures (Scheme 2). Thus, Rh(III) complexes catalyze the reaction of these substrates with alkynes, leading to benzoxepines² or spirocycles³ – which rearrange into azulenones by simple heating – under mild conditions. The 2-alkenylphenols can also react with carbon monoxide to produce very appealing coumarin products,² while reaction with allenes leads to the formation of chromene products which are heterocycles present in many bioactive molecules.⁴

Lately we have also been working on the development of asymmetric reactions involving C–H bond activations. Another important aim in our group is to deepen the understanding of the mechanism of these transformations, so we like to go through both complex mechanistic experiments and DFT calculations.



Scheme 1 Rh(III)-catalyzed intramolecular annulation between benzamides and alkynes



Scheme 2 Rh(III)-catalyzed intermolecular annulations of 2-alkenylphenols

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

Prof. M. Gulías My independent career is just starting, so the list of achievements of our group is still short. We like to think that our best work is yet to come. However, our work in the Rh(III)-catalyzed annulation of 2-alkenylphenols with alkynes is the one I am most proud of because it allowed our group to be considered an actor in the field, and helped us to get some recognition.



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