CiQUS Lecture

FONDO EUROPEO DE DESENVOLVEMENTO REXIONAL
PO FEDER Galicia 2014-2020 – *Unha maneira de facer Europa*

Larrosa research group website: https://personalpages.manchester.ac.uk/staff/igor.larrosa/index.html

Abstract

The development of greener and more efficient synthetic methodologies is essential for organic chemistry to reach its full potential in its application to many applied and fundamental scientific problems. Biaryls are structural motifs predominant in numerous pharmaceuticals, agrochemicals, chiral catalysts, liquid crystal displays, and even molecular switches and motors.

The most common methodology for their synthesis involves the traditional cross-coupling between an organometallic compound, Ar-M, and a haloarene, Ar-X. In the last few years, two promising alternatives to these cross-couplings have emerged: direct C–H arylation, where a readily available Ar-H is coupled with Ar-X, and oxidative double C–H activation, where two different Ar-H are cross-coupled. These approaches use non-prefuntionalized starting materials, thus eliminating several synthetic steps and consequent chemical waste associated to traditional cross-couplings. However, several challenges have to be resolved before these new approaches can be widely applied: 1) the development of mild reaction conditions with a broad scope, 2) the control of the regioselectivity of C–H activation and, in the case of oxidative couplings, 3) the control of the selectivity of homo- versus cross-coupling, and 4) the development of conditions that can be safely used in industry. In this talk I will present some of our group's approaches towards addressing these challenges. In particular, we will discuss the use of bimetallic Pd/Ag,[1] Pd/Cr[2] and Au/Ag[3] synergistic systems and the development of novel Ru-catalysts for late stage functionalization.[4-6]

References

[1] C. Colletto, S. Islam, F. Juliá-Hernández, I. Larrosa, J. Am. Chem. Soc. 2018, 140, 9638-9643.
[2] D. Whitaker, J. Burés and I. Larrosa, J. Am. Chem. Soc. 2016, 138, 8384-8387.
[3] X. C. Cambeiro, N. Ahlsten, I. Larrosa, J. Am. Chem. Soc. 2015, 137, 15636-15639.
[4] M. Simonetti, D. M. Cannas, X. Just-Baringo, I. J. Vitorica-Yrezabal, I. Larrosa, Nature Chem. 2018, 724-731.
[5] M. Simonetti, R. Kuniyil, S. A. Macgregor, I. Larrosa, J. Am. Chem. Soc. 2018, 140, 11836-11847.
[6] G.-W. Wang, M. Wheatley, M. Simonetti, D. M. Cannas, Igor Larrosa Chem 2020, 6, 1459-1468

Prof. Igor Larrosa – Short CV:

Igor was born in Barcelona, Spain. He received his undergraduate education at the Universitat de Barcelona (1999) where he also underwent M.Sc. and Ph.D. studies with Felix Urpi and Pere Romea. A fellowship from Ministerio de Educacion y Ciencia supported three month's research in Professor Erick M. Carreira's laboratories at ETH Zurich, Switzerland. With a second fellowship he started postdoctoral research in Professor Anthony G. M. Barrett's group at Imperial College London, UK, were he was appointed group leader. In September 2007 he started his independent career as a Lecturer in synthetic organic chemistry at Queen Mary University of London, and was promoted to Senior Lecturer in 2011 and to Reader in Catalysis in 2012. In 2014 Igor moved to the University of Manchester to take up the position of Professor of Organic Chemistry.

Igor received an ERC Starting Grant in 2011 and currently holds an ERC Advanced Grant. In 2019, Igor was selected for the UK Blavatnik Award for Young Scientists as a Chemistry finalist.