

Catalysis for sustainable organic reactions, brief summary.

The "catalysis for sustainable organic reactions" group was created in 2019 and, since then, has launched four lines of work based on 1) ultrasmall clusters (Science 2012, Nat. Mater. 2017, Nat. Catal. 2021), 2) simple inorganic oxides (Nat. Commun. 2020, Angew. Chem. Int. Ed. 2020), 3) 2D non-carbonaceous materials (Nat. Commun. 2019) and 4) single metal atoms (Angew. Chem. Int. Ed. 2020, J. Am. Chem. Soc. 2021) as catalysts for organic and industrial reactions. During these three years, and also based on previous work by the group leader, the implementation of new catalysed synthetic methods for industrial molecules (ethylene for instance), chiral and non-chiral drugs (antitumoral, antidepressants,...) and natural products (polyketals,...), among others, has been achieved, using in some cases cascade reactions to shorten the synthetic routes.

The group is currently composed by 14 researchers, including 3 post-docs and 8 pre-docs, with a gender balance policy. Regular seminars and meetings are carried out to maximize information sharing and teaching.

Not only publications in the best reputed journals in general science (Science, Nature series, ...) and chemistry (Angew. Chem. Int. Ed., J. Am. Chem. Soc., Chem. Sc.,...), but also twelve patents have arisen from our studies. Three patents are licensed and under exploitation, and we have research contracts with multinational chemical companies such as Zschimmer and Schwartz (Germany) and International Flavours & Fragrances (EE.UU.). The group regularly achieves different financed projects in competitive calls in Spain. In total, the group has attracted to CSIC more than 2 million euros from private and public institutions, in just 3 years.

The following representative examples of publications and patents in just the last year provide evidence of creative thinking, excellence in research and the ability to conduct ground-breaking projects in our group.

- 1 Garnes–Portolés, F.; Greco, R.; Oliver–Meseguer, J.; et al; Leyva–Pérez, A. 2021. Regioirregular and catalytic Mizoroki–Heck reactions Nature Catalysis. Springer Nature. 4, pp.293-303.
- 2 Greco, R.; Lloret, V.; Rivero–Crespo, M. A.; Hirsch, A.; Doménech–Carbó, A.; Abellán, G.; Leyva–Pérez, A. 2021. Acid Catalysis with Alkane/Water Microdroplets in Ionic Liquids JACS Au. ACS. ASAP.
- 3 Miguel Angel Rivero-Crespo, Judit Oliver-Meseguer, Klaudia Kapłońska, Piotr Kuśtrowski, Emilio Pardo, José Pedro Cerón-Carrasco, Antonio Leyva-Perez. Cyclic Metal(oid) Clusters Control Platinum–Catalysed Hydrosilylation Reactions: From Soluble to Zeolite and MOF Catalysts. Chem. Sci., 2020, 11, 8113-8124 (also cover).
- 4 Marta Mon, Rosaria Bruno, Sergio Sanz-Navarro, Cristina Negro, Jesús Ferrando-Soria, Lucia Bartella, Leonardo Di Donna, Mario Prejanò, Tiziana Marino, Antonio Leyva-Pérez, Donatella Armentano, Emilio Pardo. Hydrolase-like catalysis and structural resolution of natural products by a metal–organic framework. Nat. Commun., 2020. doi.org/10.1038/s41467-020-16699-3.
- 5 Miguel Ángel Rivero-Crespo, María Tejada–Serrano, Horacio Pérez–Sánchez, José Pedro Cerón–Carrasco, Antonio Leyva–Pérez. Intermolecular Carbonyl–Olefin Metathesis with Vinyl Ethers Catalyzed by Homogeneous and Solid Acids in Flow. Angew. Chem. Int. Ed. 2020, 59, 3846 –3849. doi.org/10.1002/ange.201909597.
- 6 Antonio Leyva Pérez; Estela Espinós Ferri; Carlos López Cruz. EP21382234.9. SELECTIVE CATALYTIC ALKENE ISOMERIZATION FOR MAKING FRAGRANCE INGREDIENTS OR INTERMEDIATES Spain. 23/03/2021. International Flavors and Fragrances.