Iron cross-coupling Reactions enabled by Visible Light: A sustainable strategy to assemble functional molecules

Timeline | 2021 to 2024

Budget | 305,100 €

ICIQ People | Fabio Juliá

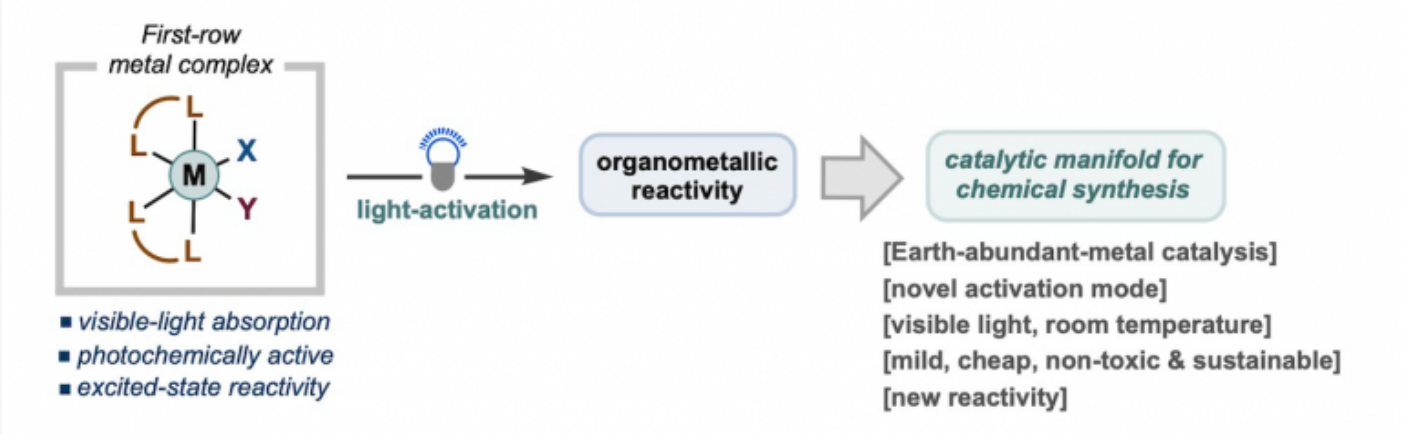
Shining light on Earth-abundant metal complexes: A photochemical route towards sustainable catalysis

Call | La Caixa Junior Leader Incoming 2020

SUMMARY

Sustainability is one of the central driving forces to develop new methods for the manufacture of the functional molecules that support our daily lives such as medicines, agrochemicals, or key components of smartphones and other devices. The synthesis of these products is currently based on cross-coupling reactions that typically rely on precious metals such as palladium. Nevertheless, in view of the abrupt increase of the price of some of these metals and their progressive depletion, is crucial to develop new solutions based on Earth-abundant metals that are sustainable in the long term to ensure the supply and unlimited access to those products of strategic value.

Our research program aims to discover innovative reactivity modes in inexpensive and non-toxic first-row metal complexes with the overarching goal of designing useful and sustainable tools for chemical synthesis. Earth-abundant metal complexes display a rich photochemistry, however, the exploitation of their innate photoreactivity remains a fairly unexplored opportunity to activate catalytic metal centers and promote chemical events by light irradiation. The use of visible light as a clean and effective source of energy to fuel these processes, not only represents an economical and mild alternative but also constitutes a gateway to access new and distinct modes of reactivity under mild conditions, potentially offering high levels of chemoselectivity. This strategy lies at the interface between (in)organic chemistry, homogeneous catalysis, and photochemistry and seeks to apply a multidisciplinary approach to tackle global challenges of social, academic, and industrial interest.



Harnessing the innate photochemistry of Earth-abundant metal complexes to develop sustainable catalysis for chemical synthesis.

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