

**Carbon-hydrogen bond activation by organometallics:
Towards methane use as a C1-source in chemistry**

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Methane is the main component of natural gas,¹ available in vast amounts in earth crust, which provides a pivotal role for this hydrocarbon as a cornerstone for the future of sustainable chemistry, transitioning from a mere fossil fuel to a valuable feedstock for high-value chemicals. However, due to its high inertness, examples of its chemical modification are scarce, and yet reduced to laboratory-scale transformations.

In this presentation, the historical evolution of methane activation and functionalization through the intermediacy of organometallic complexes will be presented, from early examples and basic concepts to the latest breakthroughs.^{2,3} Modern transition-metal catalysts now allow for the precise cleavage of the notoriously inert C–H bond under milder conditions. By bridging past basic milestones with cutting-edge organometallic research, this contribution aims at providing a view of the collective effort yet required to transform this potent greenhouse gas into a sustainable pillar of next-generation chemical manufacturing.

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 - 2 Zhao, G.; Drewery, M.; Mackie, J.; Oliver, T.; Kennedy, E. M.; Stockenhuber, M. The Catalyzed Conversion of Methane to Value-Added Products. *Energy Technol.* **2019**, *8*, 1900665. doi: 10.1002/ente.201900665.
 - 3 Caballero, A.; Pérez, P. J. Methane as raw material in synthetic chemistry: the final frontier. *Chem. Soc. Rev.* **2013**, *42*, 8809-8820. doi: 10.1039/C3CS60120J.