Selected Metal Catalysts Spanned Over the Periodic Table towards Alkane Functionalization

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Alkanes constitute the major components of natural gas and oil, and a highly rich natural carbon source. Nevertheless, they have been applied mainly as non-renewable fossil fuels where they are burnt and carbon is lost to the atmosphere (as carbon dioxide) with serious environmental problems.

Although the inertness of alkanes has hampered their use as a feedstock for organic synthesis, their functionalization to valuable products has already been achieved, in some cases under moderate or mild conditions, by using suitable metal catalytic systems. However, such an overall approach for organic synthesis still remains underexplored and concerns one of the greatest challenges in modern chemistry.

The field has recently been reviewed in a book [1-3] and the results obtained in the author´s laboratory towards mainly the sustainable syntheses of alcohols, ketones and carboxylic acids, using a variety of catalytic systems based on diverse metals spread over the Periodic Table, are discussed. The catalytic activity is related to the electronic and structural properties of the metal and ligands, enhancing the roles of water and of metal-ligand cooperations.

References

1. Pombeiro, A.J.L.; Guedes da Silva, M.F.C. (eds.), "Alkane Functionalization", J. Wiley & Sons, Hoboken, NJ, USA, 2019 (ISBN: 9781119378808).
2. Pombeiro, A.J.L.; Guedes da Silva, M.F.C., "Preface", in ref.1.
3. Pombeiro, A.J.L., "Overview", Ch.1, in ref.1.