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Selective oxidation catalysis with Mn and H₂O₂

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Document Version

Publisher's PDF, also known as Version of record

Publication date:

2016

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Mecozzi, F. (2016). *Selective oxidation catalysis with Mn and H₂O₂: Conversion of alkenes to α -hydroxy ketones, C=C cleavage and mechanistic insights*. University of Groningen.

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Stellingen

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Selective oxidation catalysis with Mn and H₂O₂

Conversion of alkenes to α -hydroxy ketones, C=C cleavage and mechanistic insights

Francesco Mecozzi

1. Catalytic methods that use complex ligands (to synthesize) are not handy for occasional use; on the other hand, systems using “off the shelf” components require less synthetic experience and work toward a catalytic transformation.
2. The design of a catalytic system should not be done by simply screening a wide range of related ligands/complexes alone; guidance by analytical and spectroscopic techniques is essential, especially when followed over time. The insights into the mechanism of the reaction thus open opportunities to make a more versatile system.
3. Raman spectroscopy allows for quantitative monitoring of conversion, selectivity, and species involved in the catalytic cycles with high time resolution and low cost. Despite this, it remains highly underrated.
4. Designing a multistep oxidation pathway that allows for selectivity to be introduced and controlled at different stages of the conversion is a smart way to yield different “desired” products depending on the followed pathway.
5. A correct assessment of the reaction thermicity gives a good indication of the safety of carrying out reactions on large scale in batch. A correct assessment of the reaction kinetics allows for the proficient use of in-flow systems to do larger scale reactions.
6. In pursuing selectivity with a given catalytic method, OxoneTM is a regular success but presents many limitations due to its acidity, and its lack of atom economy. Resolving this dichotomy requires understanding why Oxone works so well.
7. A jack of all trades is master of none – similarly a method for oxidation that performs all possible transformations cannot be at the same time selective. As in research, multistep oxidations should be a team effort of methods.
8. Catalysis and the principles of green chemistry as a whole are the key to sustainable chemistry; however, it is asinine to perform high level science towards meeting this challenge without taking responsibility for one’s impact on the environment with simple daily actions.
9. Academy and industry are like two fascinating, though very different, ‘*belladonna*’s: they both require a high degree of expertise and skill, but want to be talked to in very different ways.
10. Being a great teacher does not mean covering an entire program, but rather being able to light the spark of curiosity in the students. Nonetheless, teaching requires passion in the teacher him or herself to provide that spark.