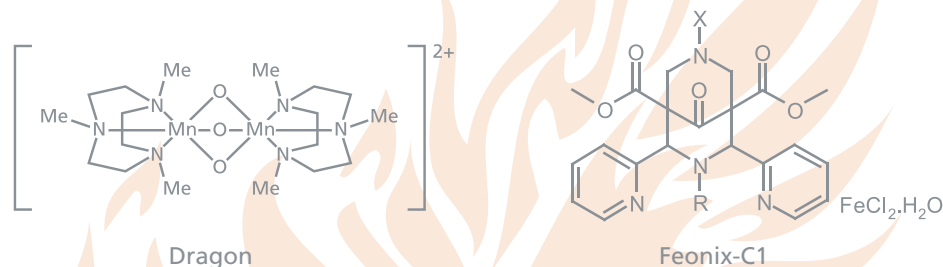


Introduction

Rahu Catalytics offers a manganese complex (Dragon) and an iron complex (FeONIX-C1) for catalyzing oxidation reactions in organic compound synthesis.



Other catalyst systems are currently under development and although not yet commercially available, please feel free to contact us for more information on development opportunities.

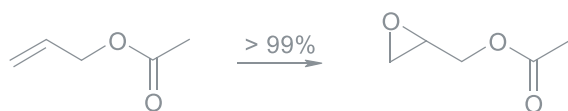
Oxidation reactions catalyzed by Dragon

Since Dragon was discovered as a powerful activator of hydrogen peroxide, it has been tested for a wide range of oxidative transformations; including stain bleaching (for laundry and dish-wash applications), textile and pulp fibre bleaching and above all oxidative transformation for organic synthesis.

Dragon is a dinuclear manganese (IV, IV) catalyst; the manganese centres are connected by three μ -oxo bridges and each manganese ion is bound to a N, N', N''-trimethyl-1, 4, 7-triazacyclononane ligand. Thanks to the ligand, Dragon is a very stable manganese complex and by choosing the appropriate conditions hydrogen peroxide decomposition can be suppressed and Dragon becomes highly selective towards oxidation. By choosing the right additives/co-catalyst (e.g carboxylic acid, sequestrant) the selectivity can be tuned towards different oxidative transformations.

Epoxidation of alkenes

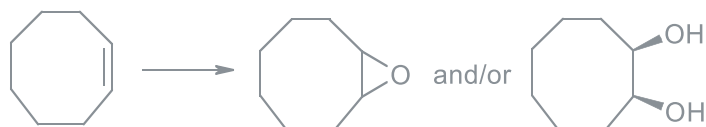
Oxidants commonly used in industry for epoxidations are peracids (peracetic acid and performic acid). However these oxidants create a stoichiometric amount of acid as by-product that has to be recycled or discarded. Dragon uses hydrogen peroxide to epoxidize alkenes and water is formed as by-product.



Dragon favors linear and cis-alkenes and high turnover numbers can be reached in combination with a co-catalyst. Surprisingly Dragon is able to epoxidize electron rich as well as electron poor alkenes.

Cis-dihydroxylation of alkenes

Dragon/hydrogen peroxide is an environmentally benign alternative compared to the toxic osmium and permanganate chemistries normally used for this type of transformation. High turnover numbers of 1000 or more can be reached and electron rich cis-alkenes give similar yields as when using potassium permanganate, with the added benefit of less waste. By choosing the appropriate carboxylate additive the catalyst can be tuned toward either epoxidation or cis-dihydroxylation.



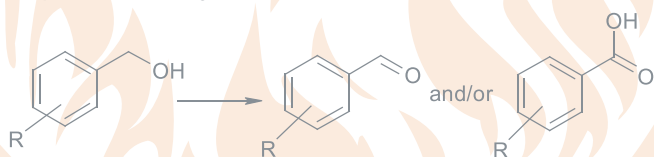
Chemical Synthesis

Carbon-Carbon bond cleavage

Even though ozone is an environmentally friendly process for carbon-carbon bond cleavage, extensive safety measures have to be taken when using this process. Dragon and hydrogen peroxide can provide a safer route from the alkene to the carboxylic acids.

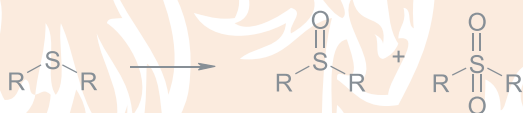
Alcohol oxidation

Dragon is also able to oxidise alcohols to the corresponding aldehydes/ketones or if desired further to the carboxylic acid in the presence of hydrogen peroxide. High turnover numbers can be reached (1000 or more) and oxidation of electron rich as well as electron poor alcohols is possible. No stoichiometric by-products (organics or salts) and chlorinated waste streams are produced in comparison to the well known Swern and Tempo oxidation systems.



Sulfide oxidation

Dragon and hydrogen peroxide can oxidise a sulfide to a mixture of sulfoxide and sulfone or exclusively to the sulfone product. The sulfone can be formed at high turnover number and frequency.



In conclusion, Dragon activated peroxide is an atom efficient and environmentally benign replacement for (toxic) bulk oxidants e.g. osmium, chromate, permanganate, peracids, hypochlorite etc.

Oxidation reactions catalyzed by FeONIX

FeONIX is a pentadentate iron complex which was discovered when looking for a catalyst that can bleach stains without the use of peroxycompounds (i.e. alkylhydroperoxides and hydrogen peroxide). FeONIX is able to oxidise alkenes via an auto-oxidation process to epoxides and in the presence of hydrogen peroxide to a mixture of cis- and trans-diols. FeONIX also activates allylic carbon-hydrogen bonds to form hydroperoxides in the presence of oxygen. These hydroperoxides undergo a radical chain reaction catalyzed by FeONIX. This type of chemistry is suited for polymerization reactions.

Industries Served

Our catalysts can be used in the pharma, flavor & fragrance, surfactant, CASE (coatings, adhesives, sealants, and elastomers), agrochemical and other fine and specialty chemical industries, to synthesize organic compounds.

How we work/how to reach us

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