

Research Group n. 1
UNIVERSITY OF CATANIA

Asymmetric Synthesis and Selective Metal Catalyzed Oxygen Transfer to Organic Molecules

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The aim of our research group is the design of catalytic systems in order to transfer oxygen to bioactive molecules or to organic molecules of potential applicative interest. Our work is addressed to systems able to trigger the activation of cheap, easily available and environmentally friendly reagents such as hydrogen peroxide or potassium peroxomonosulfate (caroate), by generating in situ very reactive peroxidic species. Candidate systems for such goal are water soluble metal-salen catalysts or carbon nanoparticles. This system is a very flexible and efficient oxidant agent and it allows to obtain very widely employed synthons, such as epoxides, diols, and so on. However, its potentialities toward the oxidation of bioactive molecules, which are very appealing as fine chemicals, are largely unexplored. Therefore, with the aim of designing very efficient and selective catalytic systems to perform oxidation reactions, our target is the oxidation of both biomolecules containing unsaturated functionalities and non natural model substrates by using metal-salen/hydrogen peroxide and carbon nanoparticles.

A second target is the design and the synthesis of chiral macrocycles as ligands which are able to act as enantioselective receptors, since their use in the field of enzyme mimicking enantioselective catalysis as well as in that of racemic resolution and of chiral sensing is of great increasing interest. In this framework recently we have developed novel asymmetric epoxidation systems based on chiral Mn salen complexes able to control enantioinduction by molecular recognition exerted by calix[4]arenes linked to the metal center. As well as we have prepared resorcarene cavity based ligands which linked to suitable metal centers can work as catalysts for asymmetric synthesis.

Keywords: hydrogen peroxide, salen, catalysis, rhenium, enantioselectivity.

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SUPPLEMENTARY MATERIAL

Detailed list of the components of the research groups
(*permanent staff, included graduated students and postdocs*)

Name	Surname	Position *	Affiliation
Emanuela	Amato	PA	University of Catania
Francesco	Ballistreri	PO	University of Catania
Rosa Maria	Toscano	RU	University of Catania
Giuseppe	Trusso Sfrazzetto	RU	University of Catania
Roberta	Puglisi	PhD	University of Catania

*: PO = full professor; PA = associated professor; RU = university researcher; PhD = PhD fellows

Apparatus
(*minimum value 25.000 € per item*)

Type	Producer	Year of acquisition
HPLC	Varian	2002
NMR spectrometer 500 Mhz multiprobe	Varian	1996
GC-MS Trace DSQ	Finnigan Thermo	2004
GC capillary columns 8420	Perkin-Elmer	1986

Technical skills

- Organic and organometallic syntheses.
- Reactivity studies (kinetic measurements).
- Design and synthesis of new chiral catalysts.
- Structure-reactivity relationships.
- Epoxidation reactions.
- Molecular recognition.