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## Bioinspired membrane systems state-of-the art and innovative solution to overcome main limits

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Nanostructured microporous membranes functionalized with biomolecules are very suitable for the development of biohybrid and biomimetic systems which find application in various fields including biocatalysis, biomedicine and biotechnology. The system simulates the biological membrane environmental like, where the biological system can be heterogenized inside/on the membrane and its passage can be regulated by controlled fluid dynamic conditions. Despite the advantages of nature simulation by bio-inspired materials application, there are some issues which need to be addressed in order to achieve the development of such systems. The main problems are related to both biomolecule stability as well as membrane cleaning and re-use.

Analyzing the use of membrane bioreactor (MBR) technology in patents development as well as their industrial application, it seems that the major development has been obtained by MBR for water treatment, whilst lower efforts have been devoted to MBR for pharmaceutical, food, cosmetics, etc. This is mainly due to more strict regulations that govern the discharge of waste water into the environment. However, the need to promote more sustainable processes for industrial production will force the development of MBR also in other fields, including biorefinery for bioderived chemicals.

In this work, alternative strategies to solve problems related to membrane stability/enzyme re-use will be described (e.g. the use of biofunctionalized nanoparticles integrated with membrane process). A deep understanding of biomolecule immobilization on membrane will be illustrated by using different biomolecule and functionalized membranes, to proof the concept of membrane versatility. In addition a biocatalytic multiphasic intensified membrane system, able produce and compartmentalize poor water stable antioxidant molecules will be also described, with the aim to provide alternative strategies for process intensification.

### Speaker Biography

Rosalinda Mazzei received her PhD from University of Calabria (UNICAL) in 2009 and she is currently a researcher of the Institute on Membrane Technology since 2011. Her expertise is in the development of biohybrid membrane process for catalysis, integrated membrane process and in process intensification. She won different prizes in international conferences and she has recently started to collaborate with different Universities such as Leuven (Belgium), University of Federico Santa Maria (Chile), School of food Engineering Pontificia, Universidad Catolica de Valparaiso (Chile), Universidad Industrial de Santander (Colombia) etc. She published about 50 articles on international journal and more than 10 chapters on books.

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