



# Marcello Pagliero

Fixed-term assistant professor

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## *Education and training*

2021

### **PhD in Sciences and Technologies of Chemistry and Materials**

University of Genoa - Genova - IT

New membranes for membrane distillation process

2015

### **Master degree in Industrial Chemistry**

University of Genoa - Genova - IT

Membrane processes and module configurations for water treatment

110/110 cum laude

2013

### **Bachelor degree in Chemistry and Chemical Technologies**

University of Genoa - Genova - IT

Treatment of solutions and industrial wastewaters using membrane processes

100/110

## *Academic experience*

2022

### **Fixed term assistant professor**

University of Genoa - Genova - IT

2021 - 2022

### **Research fellow**

University of Genoa - Genova - IT

- Preparation of flat sheet PVDF membranes for vacuum membrane distillation.
- Study of the effect of fillers on the morphology and performance of the membranes
- Investigation of photothermal ability of mixed matrix membranes for direct solar membrane distillation

2015 - 2018

## **External Research Collaborator**

University of Genoa - Genova - IT

- Preparation and characterization of tubular polymeric membranes for osmotic distillation and membrane distillation processes.
- Installation, start-up and optimization of ultrafiltration and reverse osmosis pilot plant for waste water treatment.
- Failure analysis on reverse osmosis modules used in an industrial plant (water permeability and flux recovery test, cleaning effect, fouling evaluation using SEM)
- Application of microfiltration and reverse osmosis integrated processes to industrial wastewaters.
- Determination of the best conditions for pure water recovery.
- Characterization of commercial microfiltration membranes using various techniques (e.g. liquid-liquid displacement porosimetry, contact angle evaluation).
- Determination of the membrane performance for distillation application
- Evaluation of the performance of reverse osmosis membranes exploiting both laboratory and pilot scale setups.

## *Research interests*

Marcello Pagliero's research activity has been mainly focused in the field of membrane separation processes, their application in fields of industrial interest and the development of new technologies to improve their performance.

A central part of Marcello Pagliero's research activity is the development of new membranes useful to improve the performance of the membrane distillation process, making this process increasingly competitive. In particular, membranes containing fillers with photothermal properties that can directly heat the liquid on their surface have been developed; This feature can reduce some phenomena that limit the industrial application of the distillation process.

The application of membrane distillation has been studied for both desalination and for the treatment of industrial wastewater. Olive mill wastewater is an interesting example since it has a severe environmental impact but also contains polyphenols that can be purified using membrane processes. In this way, it is possible to exploit the polyphenolic component for uses in cosmetics and pharmaceuticals, and to recover fresh water for agricultural purposes.

Parallel research was devoted to CO<sub>2</sub> capture from gas streams. This is a process that is widely exploited industrially, but it can be intensified through the use of porous membranes to increase the specific surface area available for mass transfer in a small volume. In collaboration with researchers from the Complutense University of Madrid and the University of Mashhad, porous membranes based on cyclo-olefin polymers were developed and their performance in the CO<sub>2</sub> adsorption process were determined.

Apart from the activities related to the development of new technologies, several studies have been conducted on the application of a wide range of membrane separation processes to real-world cases. This work, often related to existing collaboration contracts between the University of Genoa and a third-party company, has included the study of the most appropriate plant configuration for each individual case, starting from feasibility tests carried out at the laboratories, to the testing of small evaluation units directly on the field, to the installation and assistance in the operation of integrated pilot plants.