The European Institute of Membranes (IEM) looks at water from two perspectives: developing specific membranes using new materials (organic and/or inorganic), and assessing how these membranes can be incorporated into processes, either alone or as coupled and/or multi-functional processes (membrane bioreactor, enzymatic membrane reactor, advanced oxidation, adsorption). The main purpose is to ensure the effectiveness of the separation, the concentration, or the extraction and purification of pre-identified compounds and molecules.

Our core expertise centres around developing, identifying, quantifying and modelling the basic processes that govern separation and reaction operations in aqueous media.

The majority of the institute’s work comes under IM2E discipline 3 (Metrology and innovative treatment processes). In terms of water treatment processes, the institute focuses primarily on urban and industrial effluents. Its projects focus on building knowledge around wastewater reuse, improving water quality, reducing energy use and the applications of green chemistry.

It researches innovative technologies from a comprehensive, multi-scale perspective, working in a bottom-up manner from materials to processes.
IEM has its own technology platform managed by research engineers and technicians. The platform focuses on the design and production of laboratory-scale pilot and the corresponding instruments. Meanwhile, the platform apparatus are centred around:

1. The membrane materials characterization (MEB, texture analysis, vibrational spectroscopy, x-ray diffraction, etc.).
2. The understanding of interactions between materials and processes (thermogravimetric analysis, light diffusion, interaction analysis, etc.).
3. This platform gives researchers the methodological support and tools they need to carry out innovative scientific and technological work.

**Thesis topics:**

- **PhD. JACQUIN Céline**
  - **Thesis topic:** How to tune Dissolved Organic Matter characterization in MBR processes to understand membrane fouling.

- **PhD. ESMILAIRE Roseline**
  - **Thesis topic:** Developing electrode materials for water treatment through electrochemical advanced oxidation and nanofiltration.

- **PhD. GUARDADO Ana Luisa**
  - **Thesis topic:** Enzymatic degradation of an antibiotic pool by Pycnoporus sanguineus (CS43).

- **PhD. PLUMEJEAU Sandrine**
  - **Thesis topic:** TiO2 growth on natural fibres to produce a membrane for photo-decontamination of water.

**IEM keywords**

- **Academic and industrial partners**
  - **France**
    - LGC Toulouse,
    - Université Paul Sabatier,
    - Université Marne La Vallée
    - Université d’Aix Marseille
    - Da Volterra,
    - Solvay,
    - CIRSEE
    - Saint Gobain
    - Société Actibio
    - BFG Europe
    - Suez environnement
    - Veolia
    - SAUR
    - TOTAL
  - **Europe**
    - ChiralVision (Pays bas),
    - c-LEcta (Allemagne).
  - **International**
    - INHA University (South Korea).
    - Michigan State University (USA).
    - The Catalan Institute for Water Research (ICRA) (Espagne).
    - Department of Aquatic Ecotoxicology, Goethe Frankfurt.
    - University (Allemagne).
    - Instituto Tecnologico de Monterrey (Mexique).
    - Los Andes University (Venezuela).
  - **Chrlef University (Algérie)**

**Examples of partnership project**

- **ANR CElectrON project**
  - Effluent treatment using electro-oxidation and nanofiltration:
  - >The CElectrON project aims to develop an innovative new technology – combining membrane separation, nanofiltration and an advanced oxidation process (electro-Fenton process) – to promote sustainable water management.

- **ANR POLPHARMA project (2015-2018)**
  - Enzymatic degradation of an antibiotic pool and carbamazepine:
  - >Innovative process using nanostructures to eliminate emerging micro-pollutants in aqueous effluents.

- **FIU CARBIOSEP project**
  - Mobile, regenerable biological treatment and separation cartridges:
  - >This onboard wastewater treatment solution is a true environmental breakthrough, promoting sustainable development, boosting energy efficiency, reducing energy use, and removing the need for chemical products.