Today, water scarcity represents a major worldwide concern for society, as there is a lack of available water resources to meet the water demand for different purposes, such as drinking, domestic uses, irrigation, industrial application, etc. This global water scarcity issue needs to be faced with sustainable strategies, such as the re-use of water, wastewater treatment or seawater desalination. In this regard, among the modern water treatment technologies (such as advanced oxidation processes, photoelectrocatalysis), membrane technologies (such as ultra/nanofiltration, reverse osmosis, forward osmosis, etc.) represent the primary way to desalinate seawater or remove pollutants (heavy metals, particulates, microbials, etc.) from water. However, depending on the membrane type (material, intrinsic structure, hydrophobicity, porosity, etc.) and technology used, membranes can efficiently remove the pollutants while offering attractive water transport (permeation). Likewise, the efficiency and productivity of a membrane process is determined by the structural and morphological properties of the membrane interface. Since decades, asymmetric polymer membranes (top selective layer onto porous structure) have been the most investigated in membrane processes for water treatment, designed by the phase-inversion technique. However, new membrane concepts are strongly needed to offset the drawbacks of polymer membrane interfaces, including low chemical, physical and thermal stability, which affect their separation performance. In this regard, electrospinning process, which designs polymer electrospun nanofiber interfaces, has become a modern alternative for membrane fabrication. However, even if electrospinning tailors peculiar fiber morphologies from a range of polymer-solvent systems, the development of outperforming polymer electrospun interfaces with attractive and tunable properties for molecular separations (e.g., water purification) still remains as a challenge. The incorporation of nanosized inorganic materials, such as metal organic-frameworks (MOFs), with relevant separation capability can improve the performance of the hybrid electrospun interfaces. However, to reach such an improvement, they need to synergistically interact at the MOF-polymer interface while exhibiting a compelling interconnected structure. Therefore, **the core of this project is to study, design and characterize new MOF-dopped polymer-based electrospun interfaces with outperforming structural properties.** In general, we will explore different type of polymer phases and nanosized MOFs. Inorganic-polymer composite interactions will be deeply investigated and then confectioned into electrospun nanofibers, seeking for more structurally attractive interfaces for high filtration performance and selectivity. Apart from the composite composition and its physicochemical properties (e.g., viscosity, conductivity, surface tension *etc.*), **we will also study the effect of <u>polymer composite properties</u>, <u>interactions of polymer-MOF phases, operating variables of electrospinning</u> on the structural properties (fiber diameter, shape, morphology, geometry, porosity, hydrophobicity/hydrophilicity, molecular orientation, crystallinity, among others) of the final hybrid electrospun interfaces.** Here, we will study the impact of the structural properties on their filtration/adsorption performance along with involved separation/transport mechanism in filtrating water containing model pollutants (heavy metals, humic acids, etc.,). At this point, we need to understand how the chemistry of the MOF (chemical composition and the chemistry of the molecular building), as well as load, size, shape, organic linker sides, surfaces area, pores, among other properties, influence on the spinnability of the final polymer based electrospun fiber. This innovative approach is an advance in developing hybrid nanostructured materials, understanding properly the interaction between the inorganic and organic phase and their effect in the designing of structural properties of hybrid electrospun interfaces.