

## PhD in Physics

### Research Title: 2D nanoporous membranes as nanopower generators

Funded by	Istituto Italiano di Tecnologia (IIT Torino)
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Context of the research activity	Making use of the osmotic pressure difference between fresh water and seawater is an attractive, renewable and clean way to generate power and is known as 'blue energy'. For this task, membranes made of two-dimensional materials are expected to be the most efficient, because water transport through a membrane scales inversely with membrane thickness. In recent years, the use of single-layer 2D nanoporous materials as osmotic nanopower generators has shown the promise to generate a power density much higher the current technology.
Objectives	The aim of the research will be the development of new nanoporous 2D materials by means of atomistic simulations based both on classical molecular dynamics and DFT methods. The research will focus on the analysis of the ionic transport properties of 2D porous membranes differing for the pore size, the pore termination and the type of 2D material employed. The results will be linked to the power generation capability of the membranes. The candidate will be mainly focusing on the atomistic study of new porous membranes efficiency.
Skills and competencies for the development of the activity	The students needs to have skills on computational material science, quantum mechanics and solid state physics.