PhD in Materials Science and Technology

Research Title: Development and optimization of catalysts for CO2 conversion

Funded by	Istituto Italiano di Tecnologia (IIT Torino)

Supervisor	Fabrizio Pirri (fabrizio.pirri@iit.it, fabrizio.pirri@polito.it) - POLITECNICO DI TORINO Angelica Chiodoni (angelica.chiodoni@iit.it) - ISTITUTO ITALIANO DI TECNOLOGIA

Context of the research activity	Anthropogenic CO_2 emissions are associated for about two-thirds with the electricity, heat generation, and transport sectors; coal is the main fossil fuel responsible for carbon dioxide emission. Converting CO_2 into valuable products for chemical or energy applications through the use of renewable energy sources, in particular photovoltaic, is a relevant opportunity to introduce renewable energies into the chemical and energy chains, thus realizing efficient resources exploitation, and to tackle concerns about global warming and climate change. CO_2 can be utilized as a ready-to-use raw material to obtain CO (carbon monoxide), CH_4 (methane), CH_3OH (methanol), HCOOH (formic acid) or HCHO (formaldehyde), or other added-value products. Many renewable technologies are commercially available, but there is still the need to develop selective and cost-effective catalysts, exploiting sunlight as driving energy source, to promote the CO_2 reduction reaction (CO2RR) and to move the CO_2 exploitation toward an affordable technology.

Objectives	The objectives of this PhD are: ▪ Development of novel, selective low-cost, and green catalyst materials for the reduction and conversion of CO_2 to added-value products. Among others, photo-electrocatalyst based on transition metal oxides, and organic catalysts, will be considered. ▪ Optimization of the synthesis procedure and correlation of the physico-chemical properties of the developed catalysts with the catalytic activity to the desired product.

Skills and competencies for the development of the activity	Students with Physics of Matter, Nanotechnology, Chemistry or Material Sciences backgrounds can be considered suitable for the proposed research activities.