Research activity on H2 @CSFT: Biological production, storage and use

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In the international framework oriented to the progressive decarbonization, hydrogen plays a key role in achieving the objectives of sustainability and energy transition. In line with the EU Hydrogen Strategy, the Center for Sustainable Future Technologies of the Italian Institute of Technology (CSFT-IIT) in Turin, has chosen to strengthen the research activities focused on the H_2 economy.

In particular, pilot line facilities dedicated to electrolyzers for H_2 generation, fuel-cell for H_2 to power conversion and energy storage devices (battery and supercapacitors) are being implemented at pre-industrial level.

Moreover, promising technologies dedicated to the bioproduction of H_2 are in an early stage of study and development at CSFT-IIT. Particularly, the production of hydrogen from wastewater by means of microbial electrolysis cell (MEC) technology and the exploitation of microalgae biomass as feedstock for biohydrogen production through dark fermentation are investigated.

In addition, the CSFT-IIT has recently set up a laboratory area dedicated to biogeochemical studies related to underground H_2 storage (UHS). We exploit advanced technologies for the determination of the mineralogical composition and the characterization of the properties (e.g. porosity, permeability) of the reservoir rocks collected from site of potential interest in the perspective of geological H_2 storage. Moreover, specific protocols for the taxonomic and functional characterization of underground microbial populations have been implemented and will be discussed. In order to investigate in depth the underground microbial metabolisms, the new HP/HT H2 lab is equipped with a fully customized high pressures and high temperatures multiphase bioreactor system, which allows to reproduce the reservoir conditions.