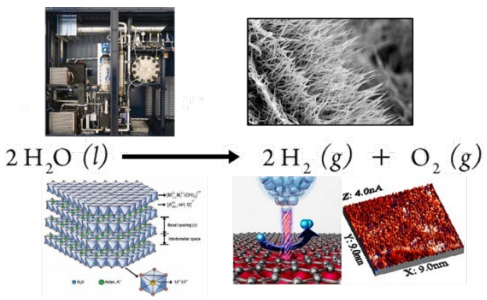
Welcome

Il Dipartimento di Scienze Chimiche accoglie il
dott. Mattia Cattelan
che terrà un seminario dal titolo:
Green chemistry catalysts: from industrial electrolyzers to model-systems.

Martedì 31 gennaio 2023, ore 16.45 Aula H, Dipartimento di Scienze Chimiche,
Via Marzolo, 1.

The development of a "green chemistry" is one of the most important challenges of our times. "Green chemistry" consists in the design of chemical products and processes that reduce or eliminate the generation of hazardous substances.
One of the most interesting subject of the "green chemistry" is the production of hydrogen from water electrolysis using with renewable sources, e.g. photovoltaic. The produced hydrogen can be stored and used in fuel cell to create electricity, overcoming the naturally intermittent nature of the renewable energy sources. The hydrogen in this way can be considered a "green vector of energy".
However, to put in place the so called "hydrogen economy" there are multiple chemical challenges, that involves all the scales from industrials to atomistical modelling.
Starting from the industrial point of view, I will speak about electrolyzers, specially about the one exploiting anion exchange membrane water electrolysis (AEMWE), underling the pro and cons of this type of electrolyzers and the challenges of the hydrogen industrial production is facing.
From an electrochemical perspective the electrolysis of water is separated in two half-reactions, the hydrogen evolution reaction (HER) at the cathode, and oxygen evolution reaction (OER) at the anode. The latter is characterized by sluggish kinetics and therefore a great work on the electrocatalysts anodes needs to be undertaken. One class of electrocatalysts most used for OER, are the Layer Double Hydroxides (LDHs) that we study in laboratory scale. Transition metals, such as Fe, Ni, Co, are the base of most LDHs for OER, because they are cheap, available and resist well in alkaline condition. I will show some LDHs investigations with different morphologies and with chemical changes, e.g. phosphidization increase their conductivity.
At a smaller atomically precise scale, I will speak about the determination by scanning tunneling microscopy (STM) and electrochemical STM of active sites of atomically thin layers of transition metal oxides in model-system. In particular, I will show results of ultra-thin layers of Fe oxides grew in ultra-high-vacuum on metal single crystals.
The aim of the seminar is therefore to merge model-system electrocatalysts findings to industrial electrolyzers for the production of "green hydrogen".



Il Direttore del Dipartimento
Michele Maggini