Earth-abundant transition metal catalysts for water oxidation under mild conditions

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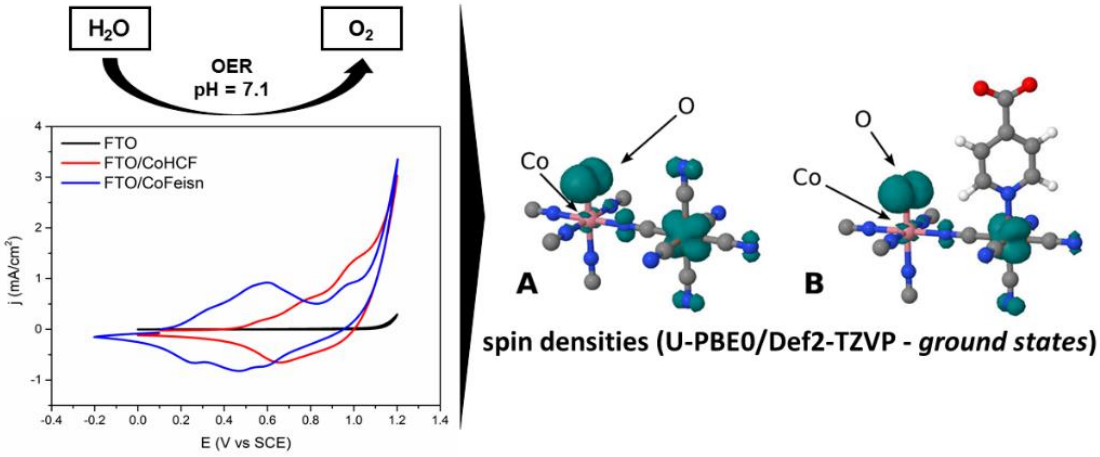
The development of an alternative to fossil fuels is one of the big challenges of our society. There is an estimate that global energy consumption in the next 35 years will be almost double the current. Because of this, the expansion of the energy matrix using fossil-based fuels can lead to the collapse of the planet. Based on this scenario, it is indispensable to study alternative sources of energy to meet this demand. Many strategies for using renewable energy sources have been inspired by the natural photosynthetic system, where water can be used as a source of energy through the production of hydrogen and oxygen[1,2].

Water Splitting (WS) reaction can be defined as the splitting of water in O_2 and H_2 in order to produce renewable energy and it is nowadays one of the most important research themes in chemistry. The production of O_2 at the anode is the most energy-intensive step in the overall WS. The water oxidation reaction is both thermodynamically (E^0 = -1.229 V vs NHE) and kinetically demanding, and so requires a catalyst to be accomplished[1]. The challenges in the development of new catalysts for water oxidation are: i) obtaining of materials that operate at low overpotential and mild conditions; ii) composition based on Earth-abundant elements; iii) high stability and robustness and iv) understanding of water oxidation reaction mechanisms to develop new catalysts[3].

In this sense, the seminar will address the challenges of water splitting field and problems involved in the water oxidation. It will be presented results concerning the development of electroactive coordination polymers produced by pentacyanidoferrate(II) and cobalt. The nanomaterial obtained has the structure like Prussian blue and it has been used as catalyst for water oxidation[3]. In addition, it will be introduced the use of 3D printed electrodes as a new platform for studies of water splitting[4].



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