Implementing bio-inspired nickel-based nanocatalysts for hydrogen uptake in a PEMFC

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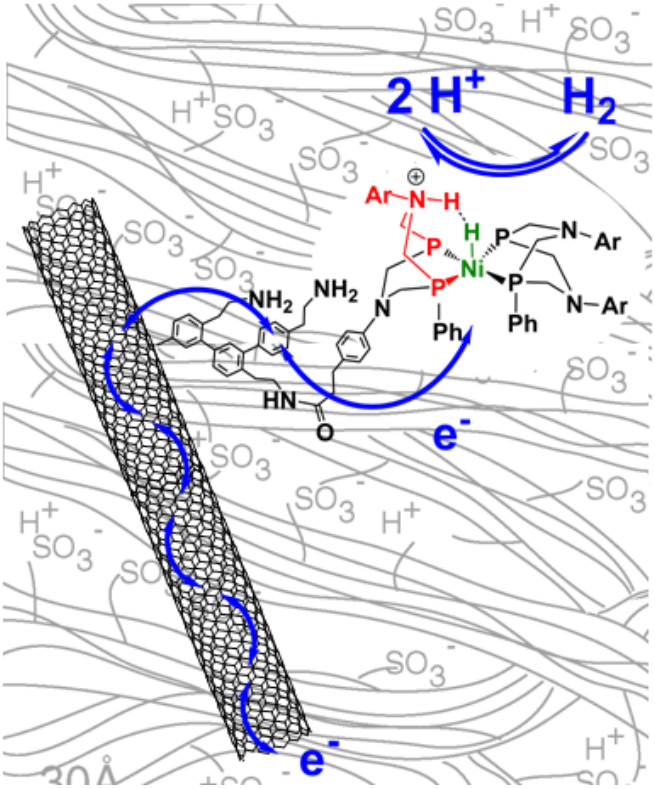
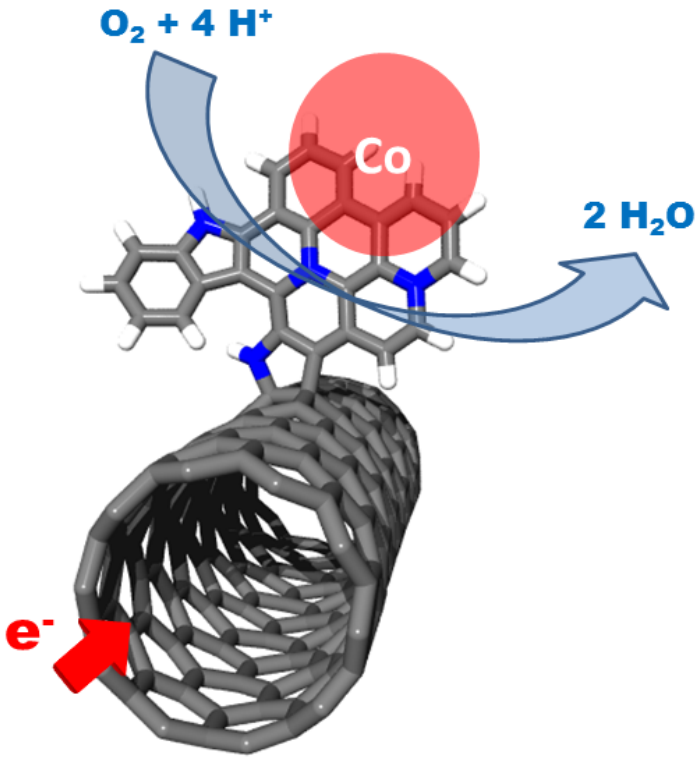
Economically viable hydrogen uptake requests platinum-free catalysts since this expensive and scarce metal is not a sustainable resource.[1] A competitive alternative should be found in living micro-organisms metabolizing hydrogen thanks to specific enzymes called hydrogenases.[2] We will describe how the combination of a bio-inspired molecular approach with nanochemical tools,[3] through the attachment of mimics of hydrogenase active sites on carbon nanotubes results in nanostructured nickel-based H_2-evolving cathode materials with remarkable performances: high reaction rates, bidirectional activity for H_2 production or oxidation without any overvoltage, exceptional stability and compatibility with the Nafion technology used for the development of PEMFC and PEM-electrolyzers.[4,5] We will then report on our recent studies regarding the optimization of such materials and their implementation as the anode catalyst in operational PEM fuel-cell in combination with cobalt-based cathode nanocatalysts.[6-8]





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