Functional catalysts for hydrogen production and uptake, and oxygen reduction based on modified carbon nanotubes networks

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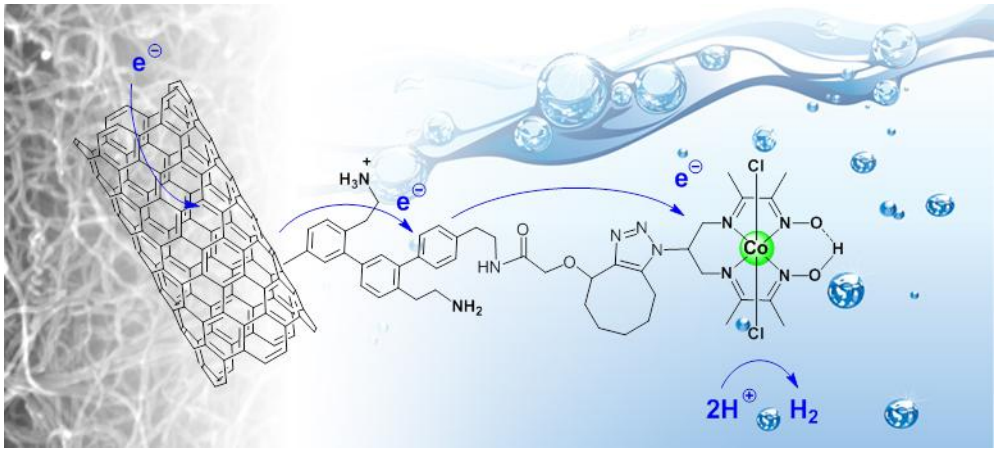
Interconversion of water and hydrogen in unitized regenerative fuel cells is a promising energy storage framework for smoothing out the temporal fluctuations of solar and wind power. However, replacing currently used platinum catalysts by lower-cost and more abundant materials is a pre-requisite for this technology to become economically viable.
We show that the covalent grafting of bio-inspired catalysts onto multiwalled carbon nanotubes results in highly active material, even under the strongly acidic conditions required in classical PEMFCs. Hydrogen evolves from H2SO4 solution with very low overvoltages (20 millivolts), and the catalyst exhibits exceptional stability (> 100,000 turnovers). One of those catalysts is also very efficient for hydrogen oxidation, exhibiting current densities similar to those observed for hydrogenase-based materials
Besides, similar carbon nanotubes networks are shown to be highly platinum-free efficient catalysts for oxygen reduction.



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