

# Bioinspired Electrocatalysts for Hydrogen Evolution Reaction

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Reducing the carbon footprint is an emerging challenge in addressing the energy crisis. The reliance on platinum (Pt) group catalysts for hydrogen/proton interconversion can be challenged by hydrogenases. These natural catalysts offer exceptional activity with minimal overpotential requirements.<sup>1</sup> Although O<sub>2</sub>-tolerant [NiFe]-hydrogenases, are more favourable for H<sub>2</sub> oxidation, they are often hindered by the H<sub>2</sub> product itself. [NiFeSe]-hydrogenases, which contain selenocysteine in place of cysteine at the nickel active center and exhibit unique attributes in water splitting, paving the way for new Ni-Se catalysts. This class of enzyme category demonstrates enhanced proton reduction regardless of H<sub>2</sub> presence, positioning them among the most active molecular H<sub>2</sub> evolution catalysts.<sup>2</sup> Consequently, the use of a biomimetic electrocatalyst paves the way for a more sustainable and cyclic fuel economy. The abundance and affordability of nickel is crucial to the development of efficient catalysts to be used for hydrogen generation.<sup>3</sup> Moreover, the non-innocent nature of biomimetic ligands coordinated to a nickel-metal center leads to complexes with significant electrocatalytic activity into hydrogen evolution reaction (HER).<sup>4</sup>

Herein, we present the synthesis, characterisation and electrocatalytic performance of mixed dithiolene-diselenolene nickel complexes. We tailored their properties by substituting the groups on the diselenolene ligand and compared them with various heteroleptic dithiolene complexes synthesized and studied in our laboratory.<sup>5,6</sup>

## References:

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