CHIRALITY ENHANCES THE EFFICIENCY OF NICKEL(II)-HYDROXIDE ORGANIC FRAMEWORKS (MHOFS) AS SPIN-SELECTIVE CATALYSTS OF OXYGEN EVOLUTION REACTION

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Electrochemical Water Splitting (EWS) is widely studied as the simplest method to produce the so-called "green-H_2", although its efficiency is strongly limited by the high overpotential required to drive the Oxygen Evolution Reaction (OER). One viable method to reduce this overpotential is exploiting spin-polarized currents.[1] Chiral materials can create spin-polarized currents in the absence of external magnetic fields, thanks to the so-called Chiral Induced Spin Selectivity (CISS) effect,[2] promoting the formation of ground state O_2 (S = 1) while eliminating by-products with S = 0 (*e.g.*, H_2O_2). Recently, Metal Organic Frameworks (MOFs) and Metal-Hydroxide Organic Frameworks (MHOFs, see Fig. 1) containing first-row transition metals have attracted interest as low cost "green" alternatives to state-of-the-art catalysts for EWS,[3,4] which are based on polluting and expensive metals such as Pt and Ir. Exploiting CISS-active chiral MOFs (or MHOFs) as enhanced electrocatalysts in EWS is still an unexplored field. Therefore, in this work we synthesized a family of nanostructured chiral (Ni-C) and achiral (Ni-A) MHOFs based on Ni^{2+} and dicarboxylic ligands (Fig. 1), with low (1), intermediate (2) or high (3) crystallinity. The catalytic activity is found to increase with increasing crystallinity and Brunauer–Emmett–Teller (BET) surface area. More importantly, the current densities are systematically higher for the chiral samples than for the achiral ones (Fig. 1), confirming that chirality is a viable strategy to design efficient catalysts for EWS and OER.

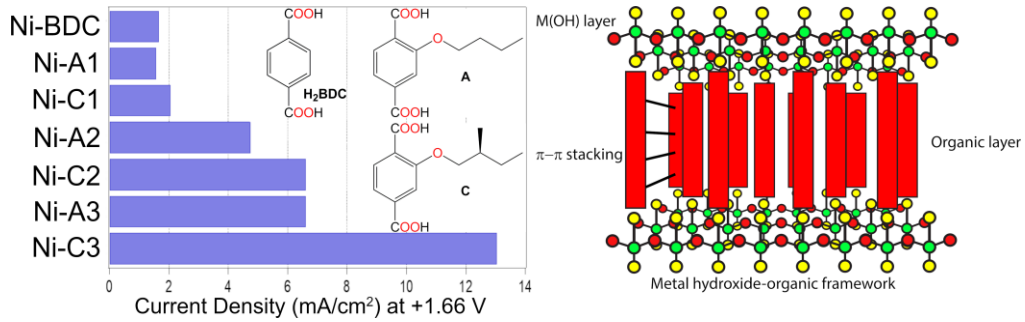

Figure 1. Left: Current densities of the Ni-MHOFs. Right: general model of a MHOFs.

References:
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