Title:	Membrane free water electrolysis under 1.23 V with Ni3Se4/Ni anode in alkali and Pt cathode in acid
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Abstract:	Hydrogen generation through water electrolysis is a promising way of storing excess energies obtained from intermittent sources. Many catalysts including have been evaluated for acidic or alkaline water electrolysers. Here, we propose the use of the Ni3Se4/Ni foam 3D electrode as anode for a membrane-free hybrid water electrolyser where the catholyte (0.5 M H2SO4) and anolyte (1 M KOH) are separated by an acid and alkali stable silicate disc of diameter 1 cm and thickness 0.3 cm to achieve the combined benefit of splitting water below its reversible potential 1.23 V. We have realized the initiation of water splitting just with 0.62 V. Significantly, the benchmarking current density 10 mA cm−2 was achieved at a cell voltage of 1.12 V which is far below the reversible potential of water oxidation (1.23 V) with the cell Ni3Se4/Ni|1 M KOH||0.5 M H2SO4|Pt. The expected issue of salt formation can be easily overcome just by refilling the anode and cathode compartments with fresh electrolytes. This novel approach of underpotential splitting of water with a membrane-free acid-base hybrid electrolyser will certainly lead to several innovative achievements in the field of hydrogen generation through water electrolysis in the future.
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