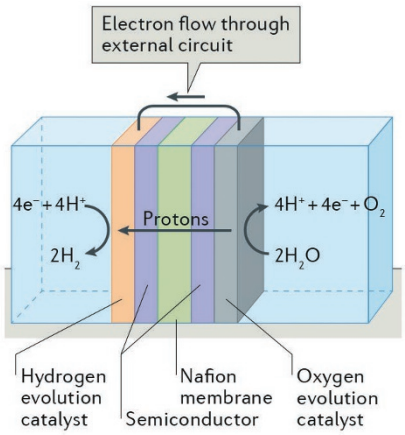
Nature Reviews Chemistry | Published online 29 Mar 2018; doi:10.1038/s41570-018-0133

IN BRIEF

HETEROGENEOUS CATALYSIS

Base metals break up water



Adapted from Roger, I. et al. (2017), Macmillan Publishers Limited

Devices that use the sun's energy to split water into hydrogen and oxygen could provide an effective means for the storage of renewable energy. For practical applications, the catalysts used to lower the activation energy of the water-splitting reactions must be both active and widely available. This limits our choices to the first-row transition metals, thereby excluding some of the most established and effective catalysts.

Writing in *Nature Reviews Chemistry*, Mark Symes and co-workers assess recent developments in the search for economically viable catalysts for water splitting, with a focus on heterogeneous catalysts amenable to photoelectrochemical applications. Theory and experiment are successfully being used to identify promising new candidates for hydrogen evolution and oxygen evolution. Promising candidates for hydrogen evolution include nickel alloys and transition metal sulfides, carbides and nitrides, whereas transition metal oxides are promising candidates for oxygen evolution. Moreover, selected examples have been used as electrode materials in working photoelectrochemical solar-to-hydrogen devices.

Symes and colleagues identify some difficult challenges in the field, including problems relating to the pH of the electrolyte, the development of robust and affordable materials to complete the devices, and the need for long-term stability testing. Furthermore, the authors call for analysis of the electrolysis products — essential for characterization of water-splitting systems — to be routinely performed, and suggest that a holistic approach is needed to realize functional devices.

Claire Ashworth, Associate Editor, Nature Reviews Materials

ORIGINAL ARTICLE Roger, I., Shipman, M. A. & Symes, M. D. Earth-abundant catalysts for electrochemical and photoelectrochemical water splitting. *Nat. Rev. Chem.* **1**, 003 (2017)