## Journal of Materials Chemistry A



## **EDITORIAL**

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## Journal of Materials Chemistry A Editor's choice collection: Advancing electrocatalysts for a sustainable world

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This Editor's choice collection has been curated by Dr Subrata Kundu, Associate Editor of *Journal of Materials Chemistry A*, with a focus on promoting sustainability in the quest to develop a robust electrocatalyst for the future.

Experimental findings in designing effective electrocatalysts has indeed formed attractive research in a very interesting area. Production of hydrogen from water electrolysis by means of electricity or combined photon energy application, electrosynthesis of various carbon-based value-added products and ammonia synthesis from nitrate or nitrogen reduction could help to mitigate the possible hazardous effects of greenhouse gases in the atmosphere.¹ The fruitful propagation of such

electrochemical reactions involves designing suitable electrocatalysts with strategically modified electronic properties.<sup>2,3</sup> In order to showcase the developments of recent advanced electrocatalysts, this collection highlights the recent experimental and review papers published on this topic.

The reviews 'Plasmonic hot-electron assisted phase transformation in 2D-MoS<sub>2</sub> for the hydrogen evolution reaction: current status and future prospects' by Das *et al.* (https://doi.org/10.1039/d1ta10918a) and 'Recent advances in highly active nanostructured NiFe LDH catalyst for electrochemical water splitting' by Dhawale *et al.* (https://doi.org/10.1039/d0ta10712c) from India highlight the recent advancement of 2D materials used for hydrogen production *via* water splitting. Roy *et al.* from India

reported the possible reasons for the activity enhancement and selectivity in sea water electrolysis (https://doi.org/10.1039/d0ta08709b). Amiri and Shahbazian-Yassar reported the recent advancement in high entropy materials for energy storage and conversion (https://doi.org/10.1039/d0ta09578h).

Angnes and Gonçalves et al. portray the recent progress of highly porous MOFderived materials for water splitting and energy storage applications (https:// doi.org/10.1039/d1ta05927k). Another interesting report by Song et al. highlights the detailed journey of ironbased electrocatalysts for nitrogen reduction reaction (https://doi.org/ 10.1039/d3ta01548c). This present collection is not limited to these reports as there are several other reports that showcase the advancement

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Dr Subrata Kundu received his PhD from the Indian Institute of Technology (IIT), Kharagpur, India, in 2005. Then he moved to the University of Nebraska, Lincoln, USA, and later to Texas A&M University, College Station, Texas, USA, as a post-doc fellow (from 2005 to 2010). He is currently working as a principal scientist at CSIR-CECRI, Karaikudi, India. Kundu became a Fellow of the Royal Society of Chemistry in 2023. He has been an associate editor of the prestigious Journal of Materials Chemistry A and Materials Advances, Royal Society of Chemistry journals since 2022, and Nature's Scientific Reports since 2015. Kundu and his co-workers are working at the forefront of materials sciences with emphasis on the energy, environment, catalysis and electrocatalysis fields.

**Editorial** 

electrocatalysts in various other applications.

This collection also covers several other experimental findings from around the globe. Nagaiah et al. from India report the 'Self-powered NH<sub>3</sub> synthesis by trifunctional Co2B-based high power density Zn-air batteries' (https://doi.org/ 10.1039/d3ta02178e). Iohn ρt a1showcase the enhanced CO tolerance of the Ni<sup>3+</sup>-rich Ni<sub>2</sub>O<sub>3</sub> catalyst for urea oxidation reaction (https://doi.org/ 10.1039/d1ta05753g). Abdinejad and Burdyny et al. report the 'Immobilization strategies for porphyrin-based molecular catalysts for the electroreduction of CO<sub>2</sub>' (https:// doi.org/10.1039/d2ta00876a). **Bedford** et al. systematically investigated the 'Identification of catalytic activity descriptors for selective 5-hydroxymethyl electrooxidation furandicarboxylic acid' (https://doi.org/ 10.1039/d2ta08306j). Liu, Gao and Chu et al. highlight the specific role of phase separated heterostructure materials for efficient hydrogen production via the methanol oxidation reaction (https://

**doi.org/10.1039/d2ta02955c)**. The report by Park *et al.* demonstrates the Co and Sn co-doped  $Ni_3S_2$  over nickel foam for water oxidation reaction where they show a unique strategy to increase the activity by tailoring the electronic structure of doped and host metal ions (https://doi.org/10.1039/d2ta09361h).

The work by Lee and Kim et al. features machine learning screening metal single atom-based transition hydrogen evolution electrocatalysts that provides a fundamental understanding on the rational design of effective electrocatalysts (https://doi.org/10.1039/ d1ta09878k). Mullins et al. report a Ni-S-P-O thin film over nickel foam with enhanced mass transport for water splitting applications (https://doi.org/ 10.1039/d0ta12097a). Kundu et provide a facile synthesis approach for nanomaterials NiMoO<sub>4</sub> microwave heating over nickel foam for water splitting applications total (https://doi.org/10.1039/d1ta02165f).

Apart from the various articles and reviews discussed, one important perspective article by Anantharaj and Noda where the 'significance of *iR* compensation in electrocatalysis' is revisited, will certainly be helpful for the research communities working on similar topics (https://doi.org/10.1039/D2TA01393B).

These are just the few examples of important works recently published. There are several other important works included in this *Journal of Materials Chemistry A* collection which demonstrate the direct and indirect goals to produce low cost and robust electrocatalysts for a better and sustainable world.

## References

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