DEPARTMENT OF CHEMISTRY, MISSOURI UNIVERSITY OF SCIENCE & TECHNOLOGY

Designing Nanomaterials for Energy Conversion and Biomedical Application

Research Topics

Solar to Fuel Energy Conversion

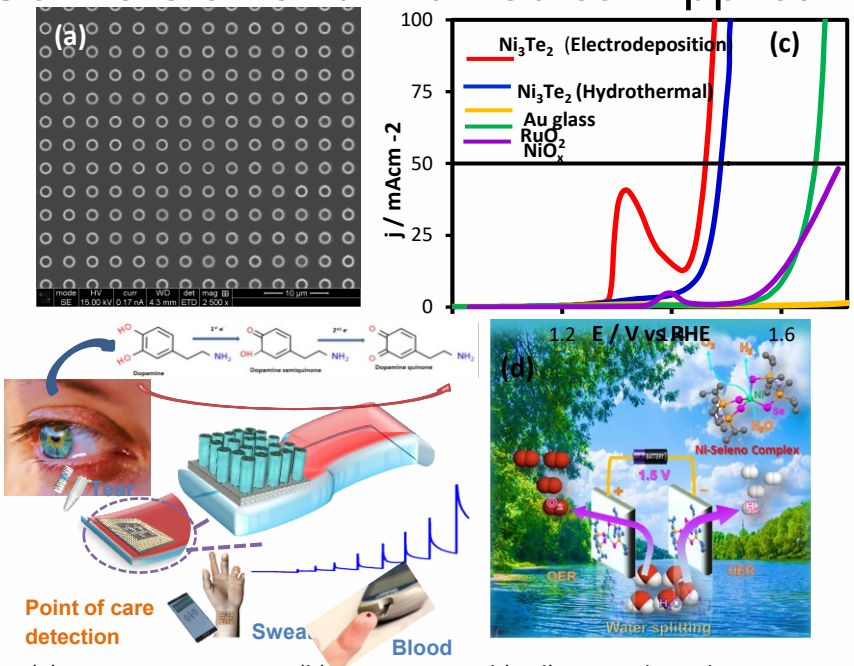
- Investigating transition metal chalcogenides for electrocatalytic water splitting.
- Understanding mechanistic details through exploration of molecular coordination complexes.
- Optimizing catalytic efficiency through controlling the chemical potential around the catalytic sites.
- Investigating nanotube and nanorod arrays for photoelectrochemical solar energy conversion.

Electrocatalytic CO_2 Reduction

- Designing electrocatalysts for CO_2 conversion to value-added chemicals through hypothesis-driven bottom-up approach.
- Understanding structure-property correlation for selective CO_2 reduction to carbon-rich products through single atom catalysts.

Designed Synthesis of Non-enzymatic Biosensors

- Investigating transition metal selenides and tellurides for direct electrochemical sensing of dopamine, serotonin, glucose etc..
- Understanding mechanistic details for analyte selectivity through exploration of compositional phase diagram.



(a) Nanostructure arays, (b) biosensors and (c, d) water electrolyzers

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Keywords

- CO2 utilization, Nanobiosensors, water electrolysis, solar energy conversion; nanomaterials; solar-to-fuel energy conversion; non-enzymatic sensors; oxygen evolution reaction.

Recognitions/Significant achievements

- Highly cited author in Royal Society of Chemistry.
- https://phys.org/news/2016-12-approach-hydrogen-production.html
- Liyanage, W. P. R.; **Nath, M**. "CdS-CdTe Heterojunction Nanotube Arrays for Efficient Solar Energy Conversion" *J. Mater. Chem. A*, **2016**, *4*, 14637-14648.
- Swesi, A.; Masud, J.; **Nath, M**. "High-Efficiency NiSe Based OER Catalysts for Water Electrolysis" *Energy and Environ. Sci.* **2016**, *9*, 1771.

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