Innovation Brief

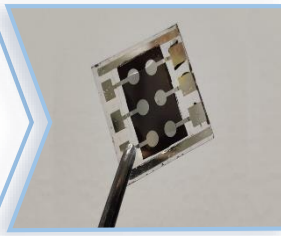
October - December 2023

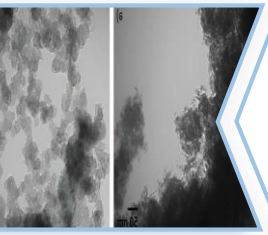
New Polymer Membranes, AI Predictions Could Dramatically Reduce Energy, Water Use in Oil Refining

Researchers at Georgia Institute of Technology describe a new kind of polymer membrane they created that could reshape how refineries process crude oil, dramatically reducing the energy and water required while extracting even more useful materials. The team also created artificial intelligence tools to predict the performance of these kinds of membranes, which could accelerate development of new ones.

Pivotal Breakthrough in Adapting Perovskite Solar Cells for Renewable Energy

A huge step forward in the evolution of perovskite solar cells recorded by researchers at City University of Hong Kong (CityU) will have significant implications for renewable energy development. Challenging the issue of the thermal instability of perovskite solar cells, the team has engineered a unique type of self-assembled monolayer and anchored it on a nickel oxide surface as a charge extraction layer.



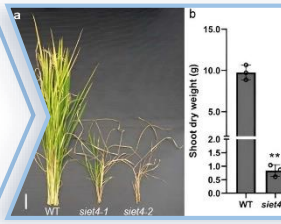


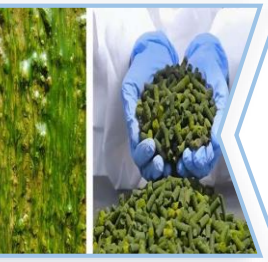
Researcher Leads Breakthrough in Production of Green Carbon Monoxide using Light

A study published in *Energy and Environmental Science*, a research team of advanced materials chemistry at the University of Toronto's have made a significant breakthrough in the use of light to convert carbon and carbon dioxide (CO2) into carbon monoxide (CO). The process includes light-powered reaction that employs the conversion in ways that are less energy- and chemical-intensive than the same reaction driven.

Identifying a Silicon Transporter to Improve the Yield of Rice

Researchers at Okayama University, Japan, identify a membrane transporter in rice that regulates the accumulation and localization of silicon in the leaves. Oryza sativa (Asian rice) can store Si to the tune of 10% of the dry weight of shoots. Their functional analyses detailing the effects of SIET4 deletion mutants were published in *Nature Communications*.





Newly Identified Algal Strains Rich in Phosphorus Could Improve Wastewater Treatment

Researchers at National Renewable Energy Laboratory (NREL) sought to develop new technology for phosphorus removal from wastewater by maximizing the ability of algae to harness solar energy to efficiently accumulate and remove phosphorus from water, storing it inside the cell as polyphosphate. These strains have the potential to boost phosphorus recovery in wastewater treatment systems along with recovering harmful or valuable metals.

Novel Method for Uranium Extraction from Wastewater Also Generates Electricity

In a new study published in the journal *Frontiers of Environmental Science & Engineering*, researchers from Northwestern Polytechnical University introduced a revolutionary SMEC method for uranium recovery from wastewater. This innovative technique not only efficiently extracts uranium but also generates electrical energy, offering a more sustainable and less complex alternative to traditional extraction methods that are often hindered by biotoxicity.