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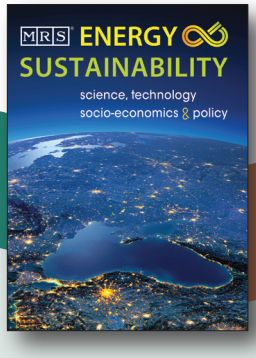


Comparison of carbon sequestration efficacy between artificial photosynthetic carbon dioxide conversion and timberland reforestation

Santiago Gonzalez Hernandez, Stafford W. Sheehan

With the average global temperature steadily increasing, there is growing interest in new technologies for carbon capture, utilization, and storage. This coincides with the decrease in cost of intermittent renewable electricity sources, specifically solar energy, necessitating new methods for energy storage. The authors analyze the effectiveness of model photovoltaic-driven carbon dioxide conversion technologies that produce liquid alcohols as compared to planting an equivalent forest. doi.org/10.1557/mre.2020.32

Renewable hydrogen for the chemical industry

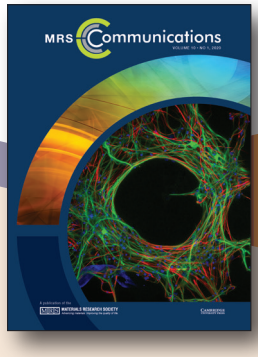
Nigel Rambhujun, Muhammad Saad Salman, Ting Wang, Chulaluck Pratthana, Prabal Sapkota, Mehdi Costalin, Qiwen Lai, Kondo-Francois Aguey-Zinsou

The chemical industry will become the major driver for oil production by 2030, relying entirely on sufficient oil supply. However, using renewable hydrogen as a fuel could help decarbonize all of chemical manufacturing. The authors summarize existing technologies for the production of renewable hydrogen including biomass and water electrolysis, and methods for the effective storage of hydrogen with an emphasis on the need for mitigation strategies to enable such a transition. doi.org/10.1557/mre.2020.33

How to avoid the perfect storm: The role of energy and photovoltaics

Maurizio Fermeglia, Vanni Lughi, Alessandro Massi Pavan

Energy, water, and food shortages, along with irreversible environmental damage and climate changes, will happen within a decade if the current course of action is maintained, preparing the "perfect storm" – interrelated events that could lead to major stress on global systems. The authors look to a visionary scientist of the past century, who pioneered the idea of a society powered by solar energy, and show, by a critical presentation of energy and carbon emission data, how this vision is now coming true. doi.org/10.1557/mre.2020.36



Electrocardiogram measurements in water using poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) nanosheets water proofed by polyurethane film

Sho Mihara, Hui-Lin Lee, Shinji Takeoka

The authors discuss effective water-resistant bioelectrodes for long-term biological monitoring, emphasizing the importance of conducting polymer materials such as poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate). This will help make it possible to assess the performances of athletes in water-based sports. doi.org/10.1557/mrc.2020.72

Rugged nanoparticle tracers for mass tracking in explosive events

Lance Hubbard, Ryan Sumner, Martin Liezers, Trevor Cell, Clara Reed, Nicolas Uhnak, Caleb Allen, Brittney Berry, Hugh Currah, Erin Fuller, Erin Kinney, Nathaniel Smith, Michael Foxe, April Carman

Investigation of high-energy materials is conducted by tracing the flow of solid matter during an explosion. This can be done with silica-covered semiconductor quantum dots. Such an effective quantification will lead to better mechanistic determination in future energetic materials and systems. doi.org/10.1557/mrc.2020.70

Three-dimensional hybrid bonding integration challenges and solutions toward multi-wafer stacking

L. Arnaud, C. Karam, N. Bresson, C. Dubarry, S. Borel, M. Assous, G. Mauguen, F. Fournel, M. Gottardi, T. Mourier, S. Cheramy, F. Servant

The authors revisit three-dimensional interconnects and layer devices for chip manufacturing. The importance of design and materials correlation is very relevant for different applications as sensors and image processing function. The authors emphasize the combination of Cu-to-Cu direct hybrid bonding technology with Through-Silicon-Via (TSV). doi.org/10.1557/mrc.2020.77

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