Advanced Water Splitting Materials EMN Workshop
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Importance of Renewable Hydrogen

Some Key Findings:

- Hydrogen is a flexible energy carrier that can be produced from any regionally prevalent primary energy source. Moreover, it can be effectively transformed into any form of energy for diverse end-use applications.

- Hydrogen with a low-carbon footprint has the potential to facilitate significant reductions in energy-related CO$_2$ emissions and to contribute to limiting global temperature rise to 2°C.

- While the potential environmental and energy security benefits of hydrogen and fuel cells in end-use applications are enticing, the development of hydrogen generation, T&D and retail infrastructure is challenging.

The great benefits & challenges are recognized world-wide
Workshop Mission: Laying a Foundation..

New Material Innovations for Clean Energy 2X Faster and 2X Cheaper

MGI - Framework

Materials Design & Synthesis

Functional Design

Process Scale-Up & Qualification

...for an Advanced Water Splitting Materials EMN for renewable H₂
A Rising Tide Lifts All Ships.....

toward clean, renewable hydrogen from water

Energy Materials Network
U.S. Department of Energy
Everyone is Encouraged to CHIME in:

- PEC Experts
- Electrolysis Experts
- STCH Experts
- Technology Analysts
- Big Data Experts
- Materials Theorists
- Synthesis Experts
- Characterization Experts
- Scale-up Experts

- **Common Cause**
- **Honesty (brutal)**
- **Integrity / Innovation**
- **Mutual Respect**
- **Enthusiasm / Energy**

we’re all in this together

accelerating pathways to affordable, industrial scale renewable $H_2$
EMN creates a nexus of industry, government, & laboratory stakeholders with resources focused on accelerating materials innovation into products.

Invites industry pull in development of specific clean energy products to ‘exercise’ and expand the network.

Spanning discovery through deployment in energy applications.
EMN on Advanced Water Splitting Materials

ADVANCED WATER SPLITTING ENERGY MATERIALS NETWORK FRAMEWORK

analytical framework

TARGETS: < $2/kg H₂ < 5 kg CO₂/kg H₂

major contributing factors

- system capital investment
- O&M and replacement costs
- feedstocks costs & carbon content
- component process & manufacture

top-level system parameters & metrics

- system conversion efficiency
- system lifetime
- materials costs
- manufacturing at-scale
- carbon mitigation

technology-specific multi-level parameters & metrics

representing tradeoffs among top-level system parameters and critical to establishing requirements for functional- and balance-of-system materials

materials requirements

technology-specific functional materials properties and metrics

including thermodynamic, kinetic and structural properties of the active materials, structures and interfaces essential to water-splitting reactions and processes

technology-specific balance-of-system materials properties and metrics

including thermodynamic, kinetic and structural properties of the materials, structures and interfaces in the balance-of-system in the water-splitting reactor

Water-splitting materials RD&D within a technoeconomic framework
It’s Time to Get to Work

To build a robust community of practice of stakeholders in advanced water splitting technologies for viable large-scale renewable hydrogen production

To lay the foundations for an Energy Materials Network consortium to accelerate commercialization of clean and sustainable hydrogen production from water

Mahalo for joining in this critically important endeavor!
### Some Housekeeping

**Thank You all for participating!**

special thanks to the Workshop Organizing Committee