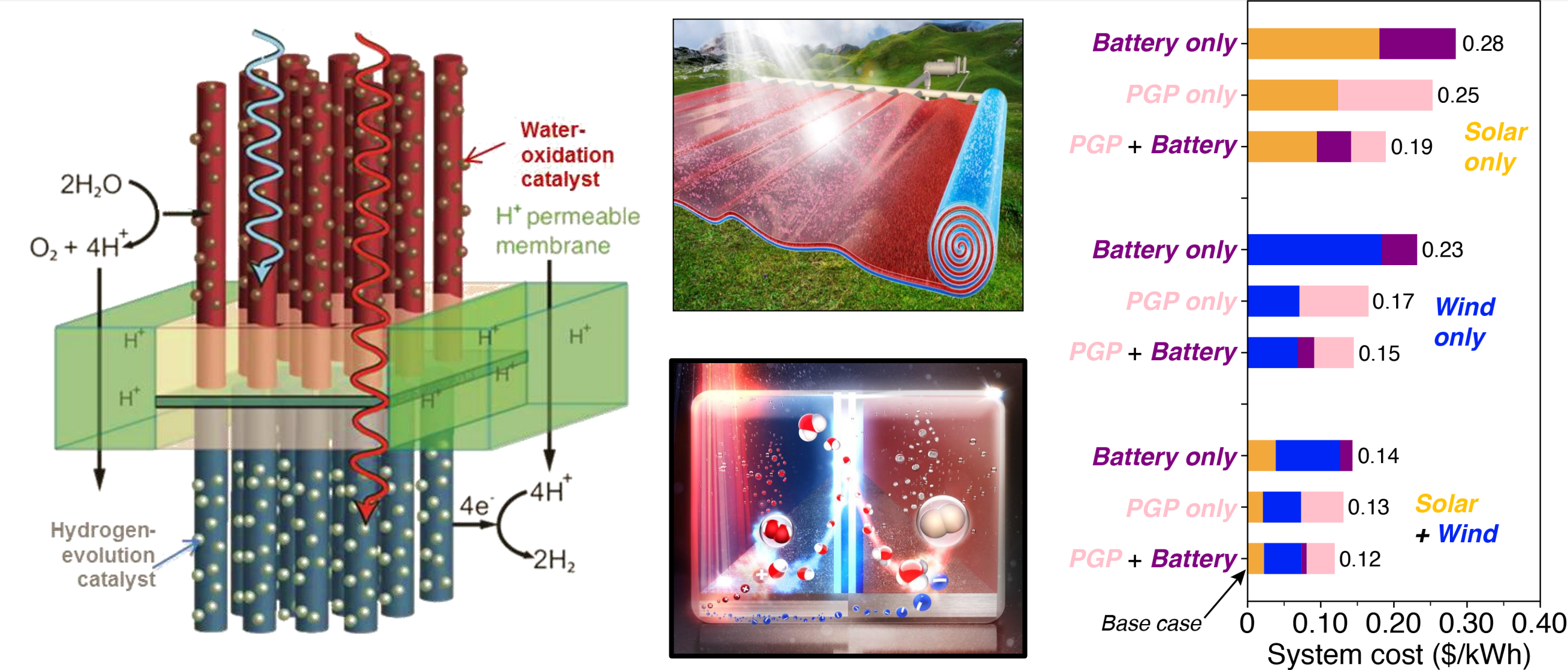
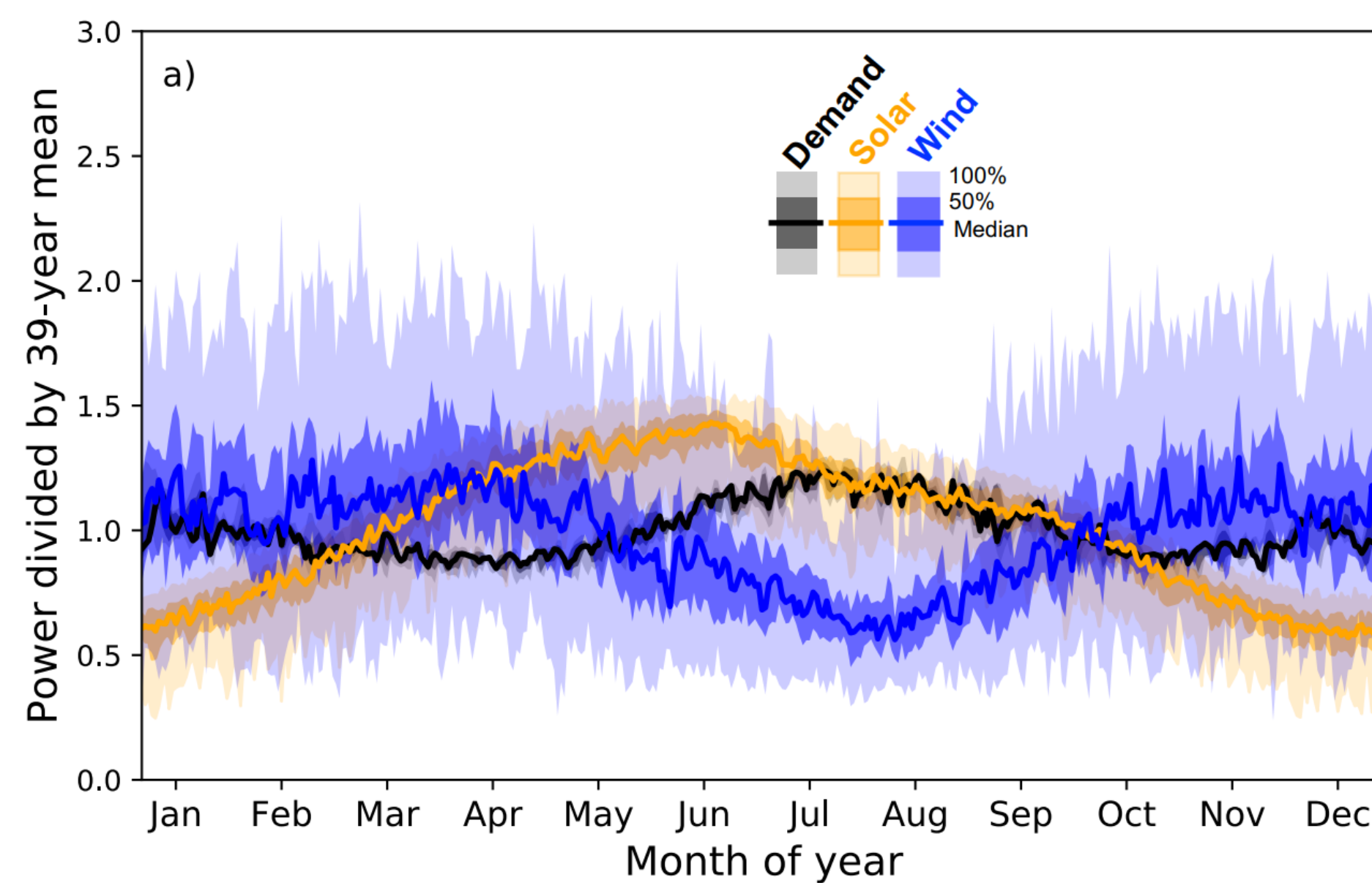
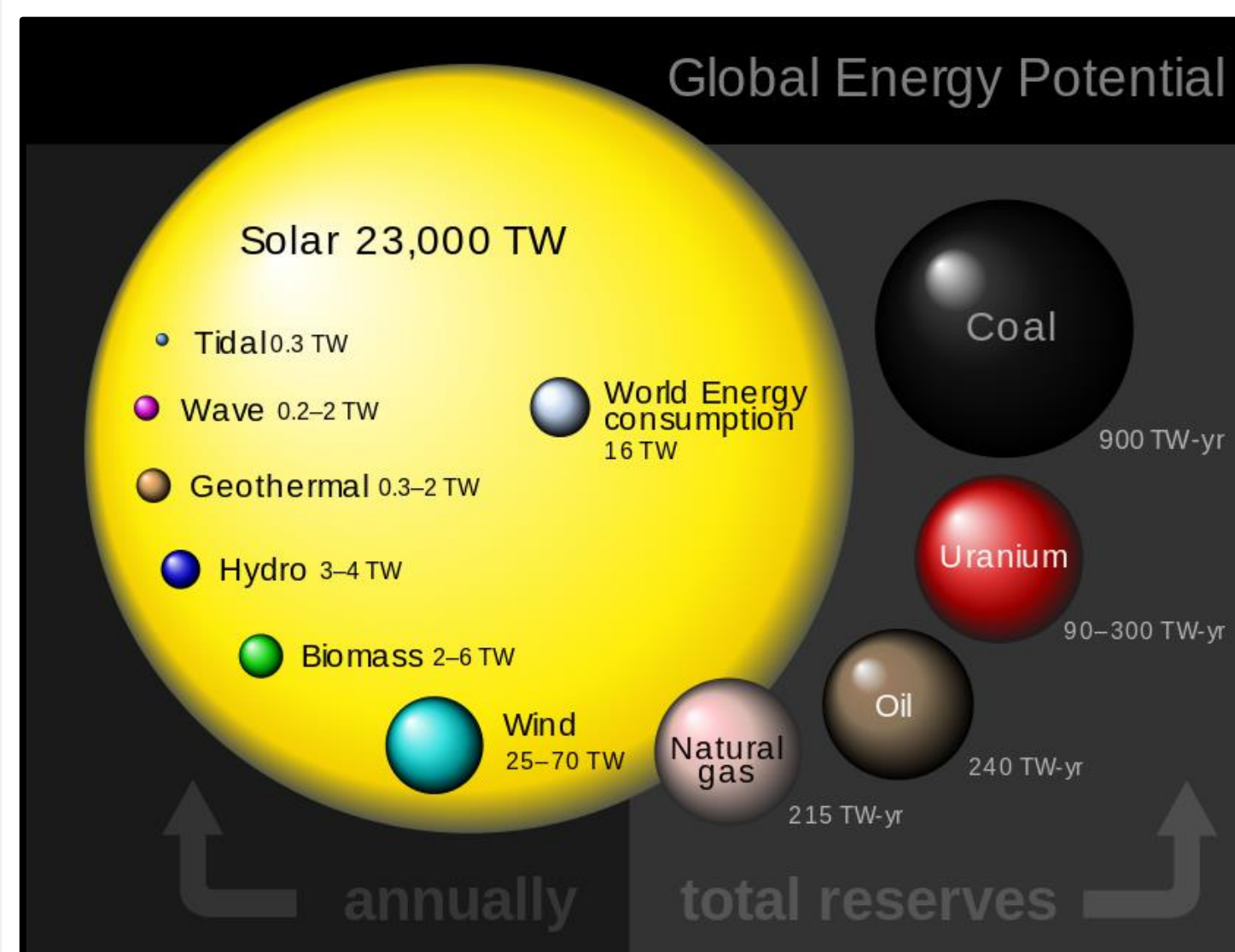




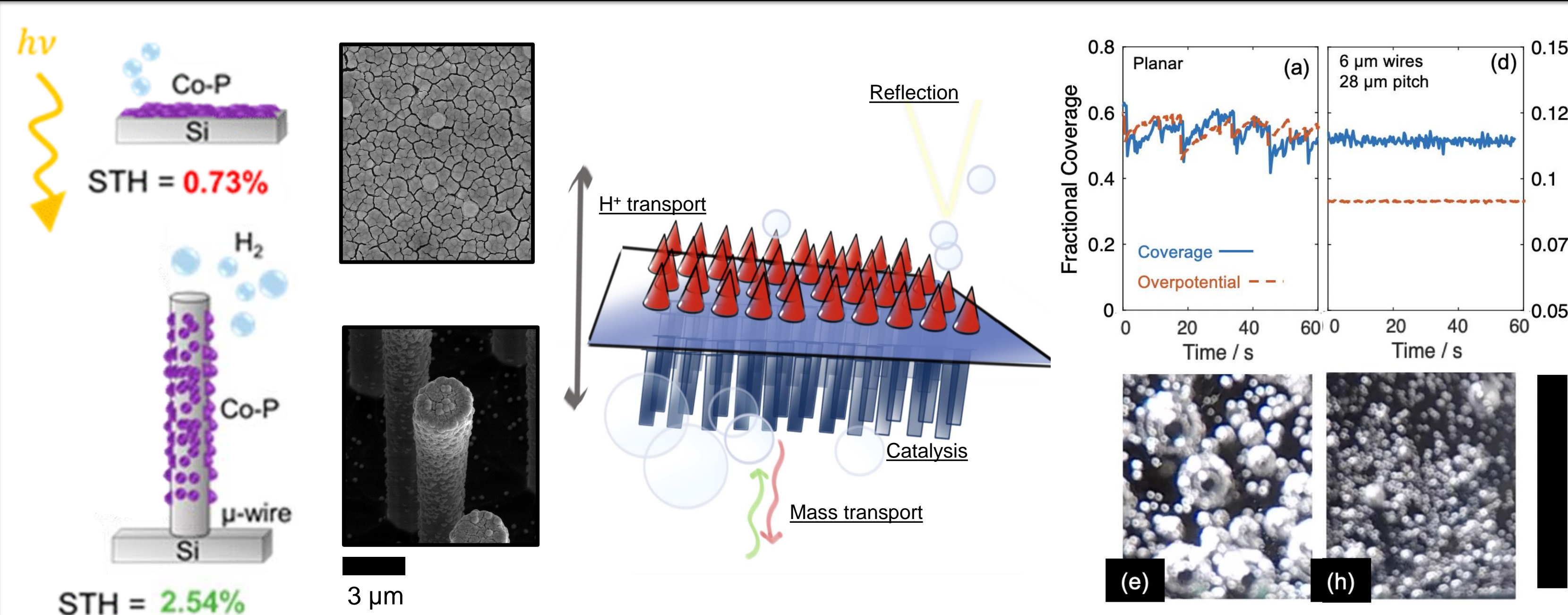
# Lewis Group



Every 100 minutes the terrestrial solar flux supplies more energy than is needed for a year of human consumption. Solar insolation is inherently intermittent and thus a storage solution is necessary.

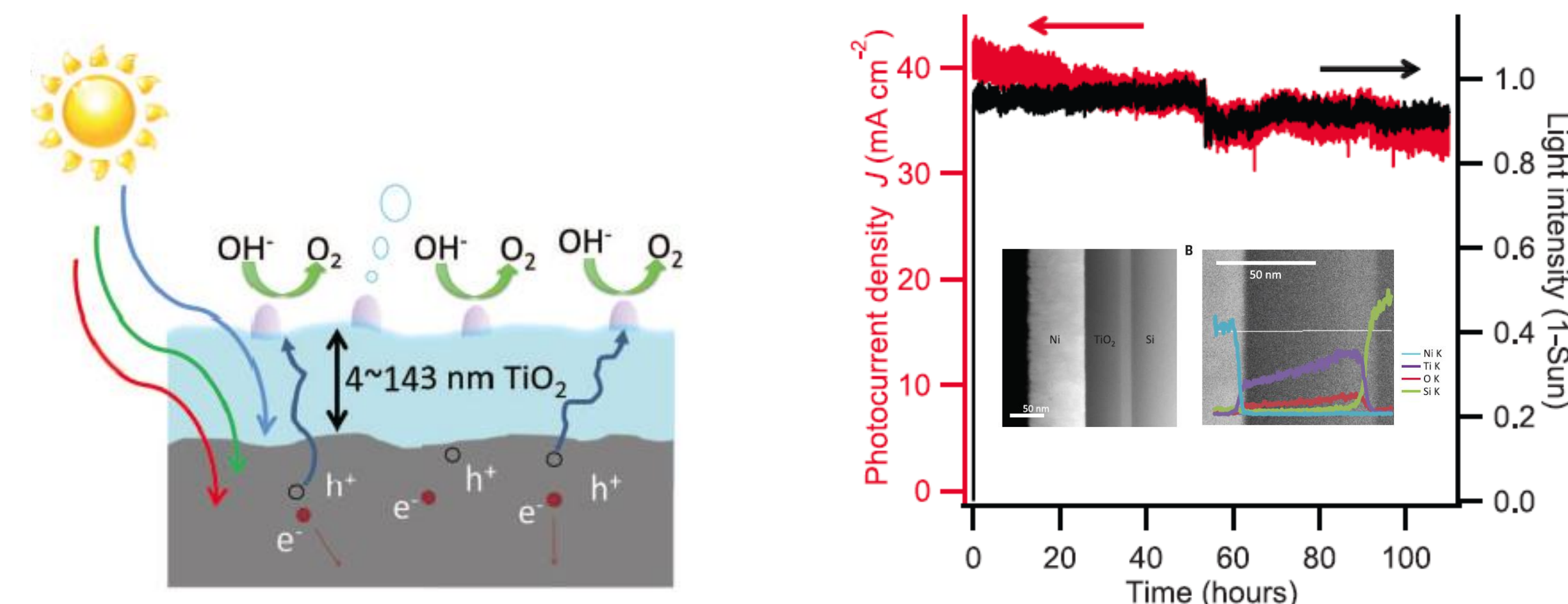


We develop scalable technologies that enable sunlight-driven photoelectrochemical fuel production based on structured semiconductors interfaced with heterogeneous electrocatalysts. Our macro electricity model shows that Power-to-gas-to-power (PGP) with hydrogen fuel reduces costs in wind-solar-battery systems.

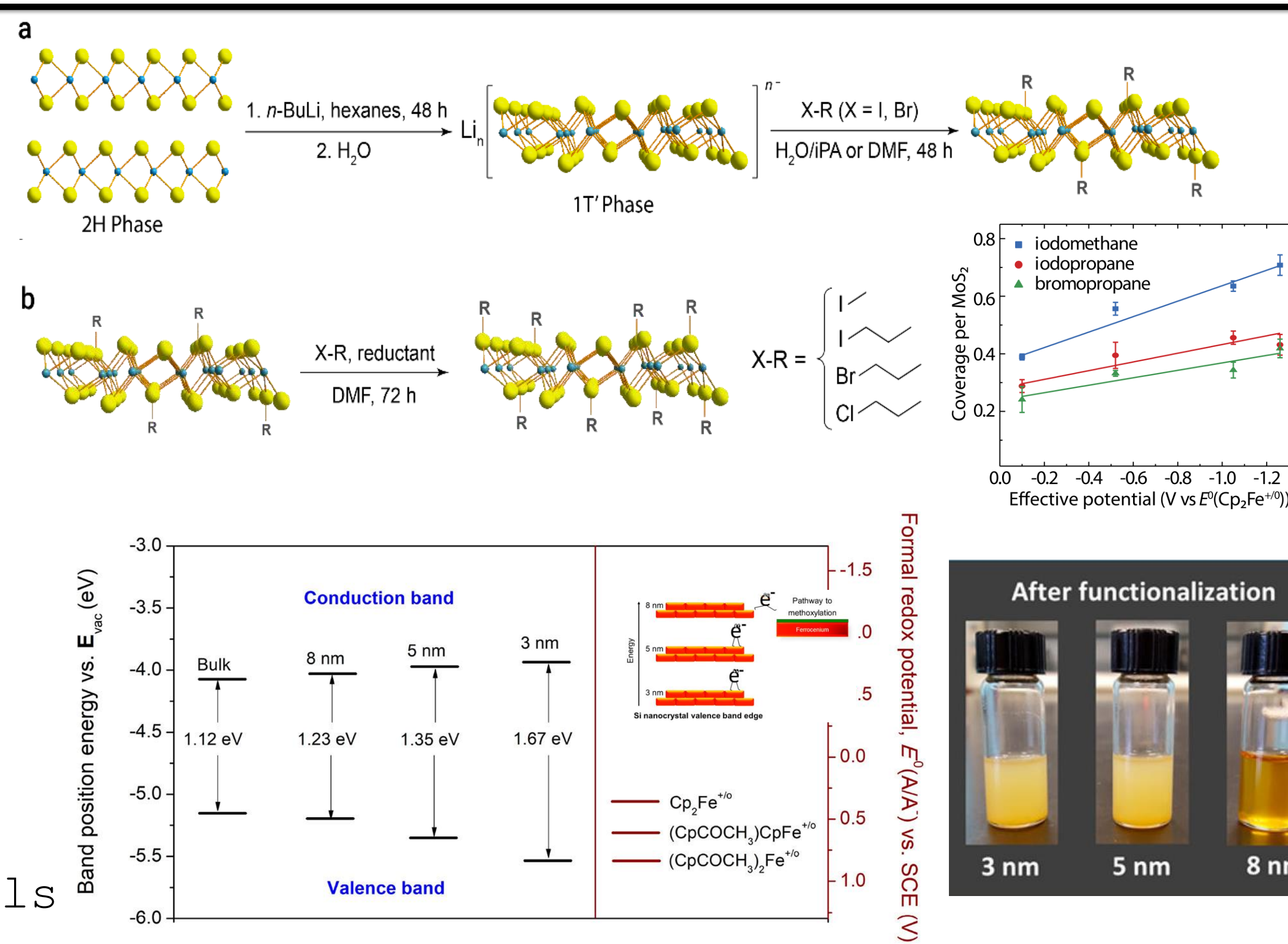


We are investigating approaches to structure and integrate semiconductor light absorbers and electrocatalyst materials to optimize light absorption, carrier collection, catalyst loading, and product generation.

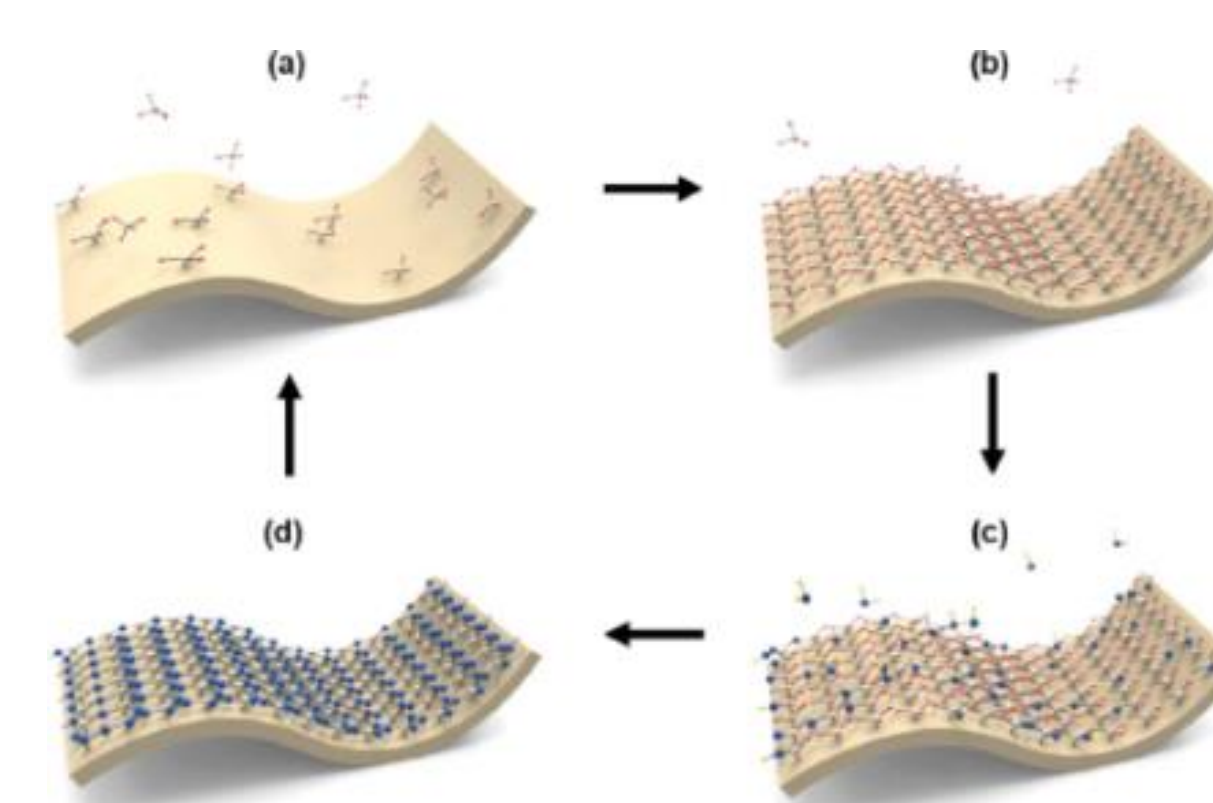
Photoelectrochemical water splitting can require the semiconductor material to demonstrate stability in highly acidic/basic pH-ranges under illumination at strongly oxidizing/reducing potentials. Conformal layers of metal oxides can be applied via atomic layer deposition to prevent corrosion and enable fuel formation.



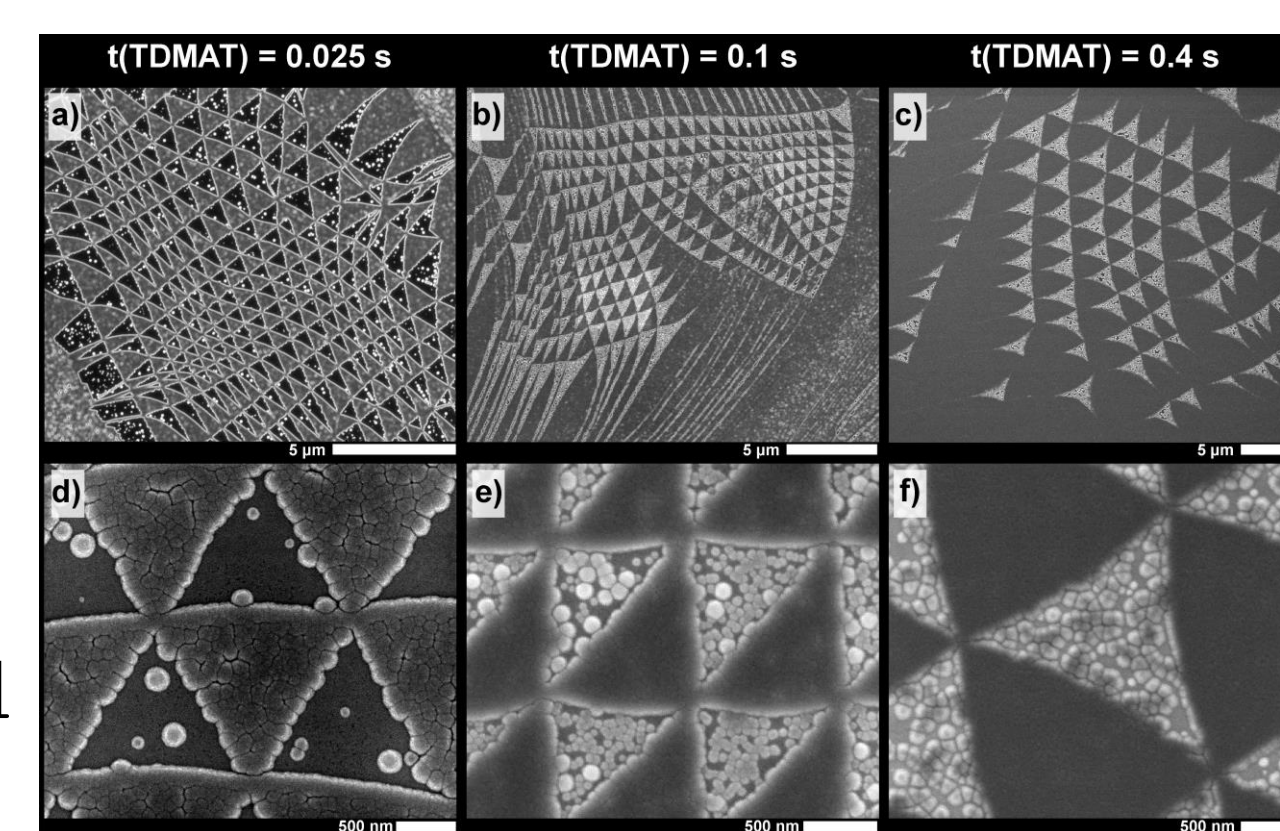
Covalent functionalization of semiconductor surfaces can be used to manipulate material optoelectronic properties and impart chemical stability and catalytic properties. We are exploring the chemistry of bulk wafers, 2D materials and nanocrystals.



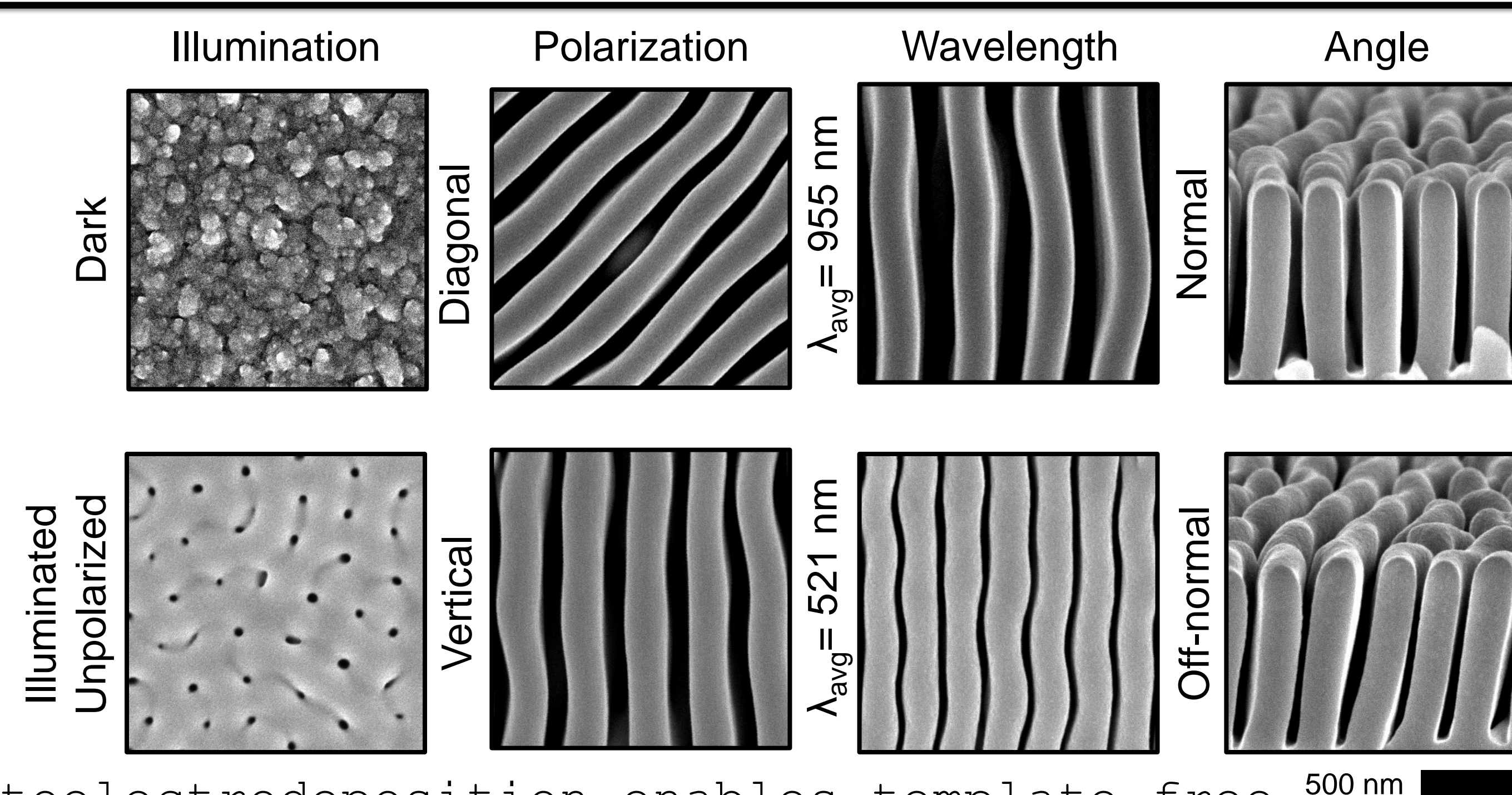
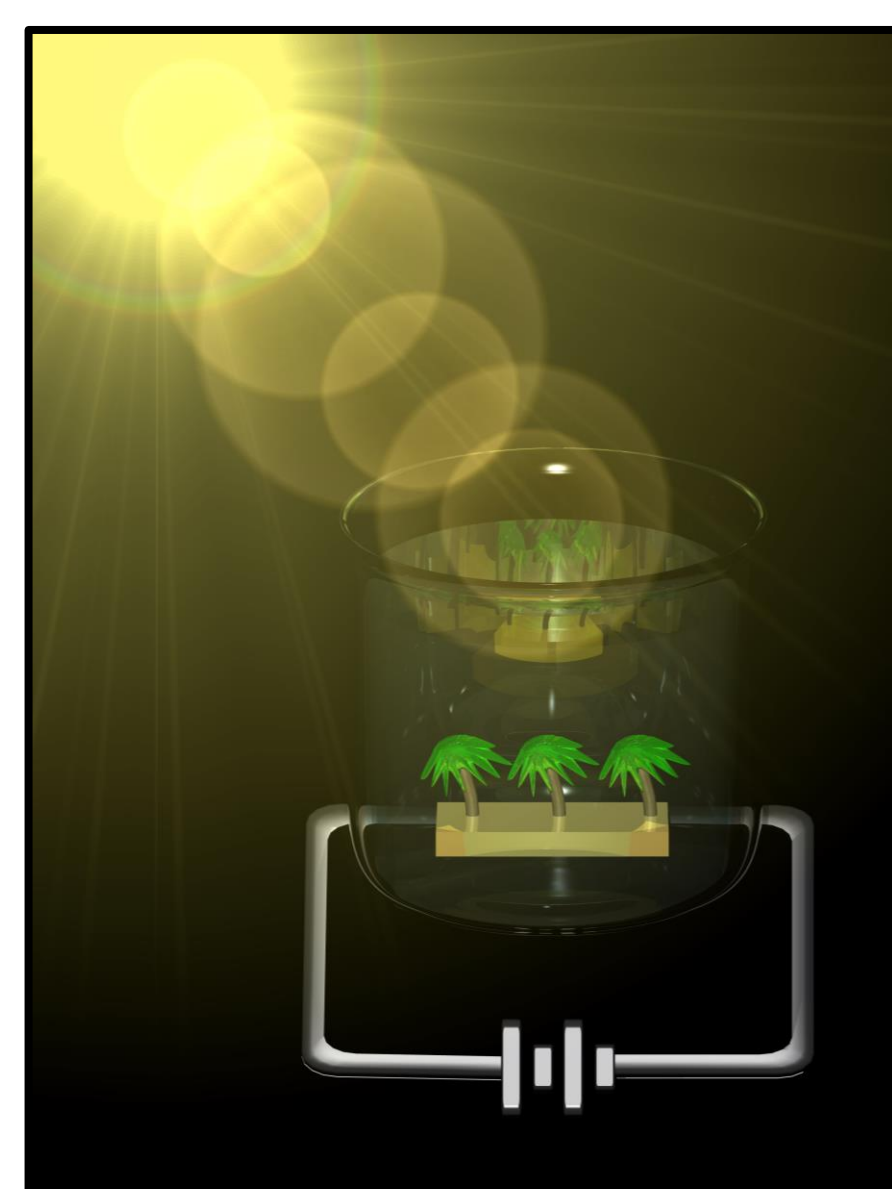
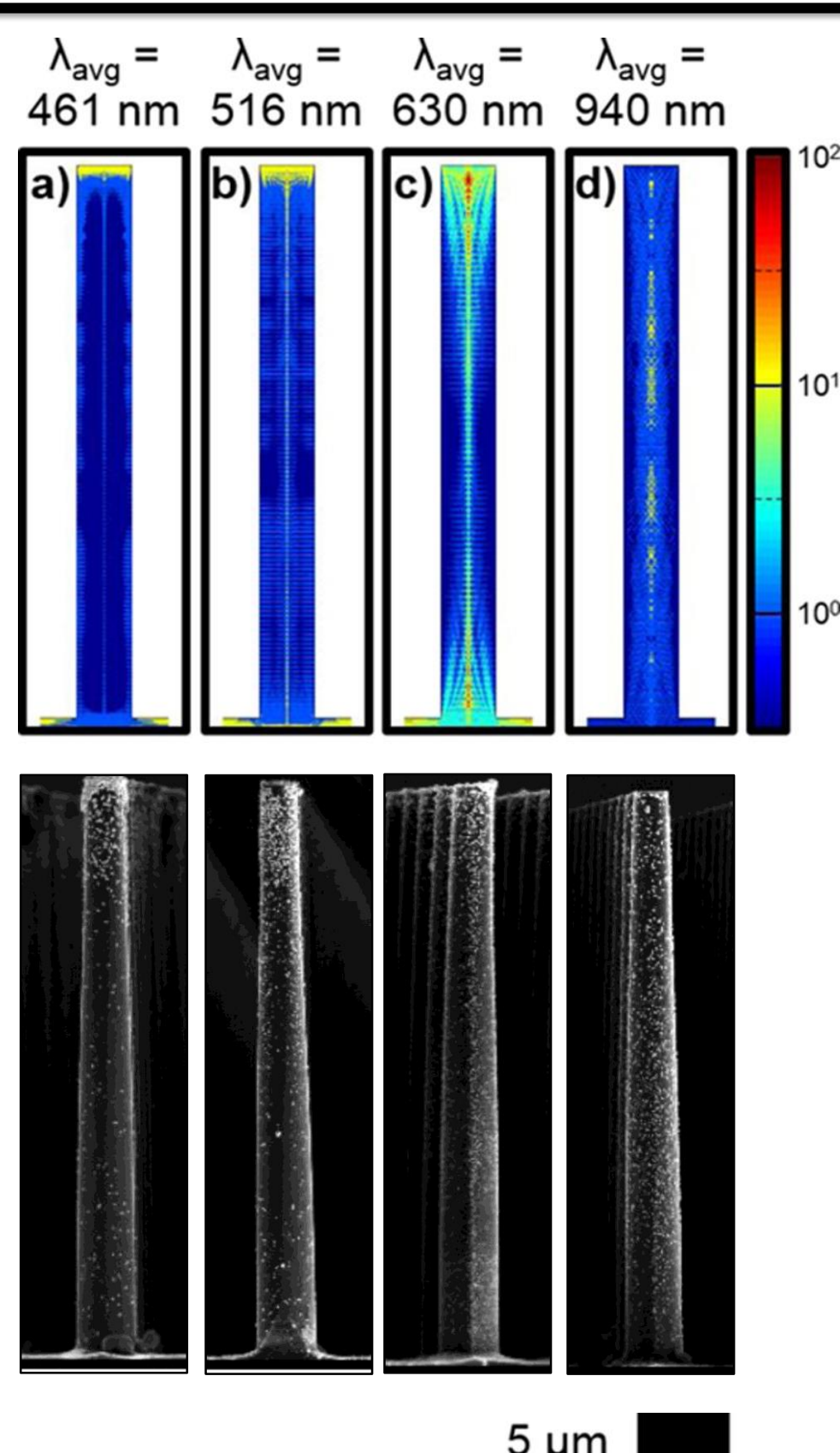
Selective atomic layer deposition can be used to investigate dislocation modified surface reactivity.



Atomic-layer Deposition selectivity targets and remediates defect sites on the surface of layered materials.



Semiconductor materials with micro- and nanoscale features can exhibit optical properties that are not observed at the macroscale. Light-metal deposition can be used to profile absorption, and selectively decorate, such structures.



Semiconductor photoelectrodeposition enables template-free generation of highly-ordered nanostructures over macroscale areas wherein the precise morphology is defined by the optical inputs.