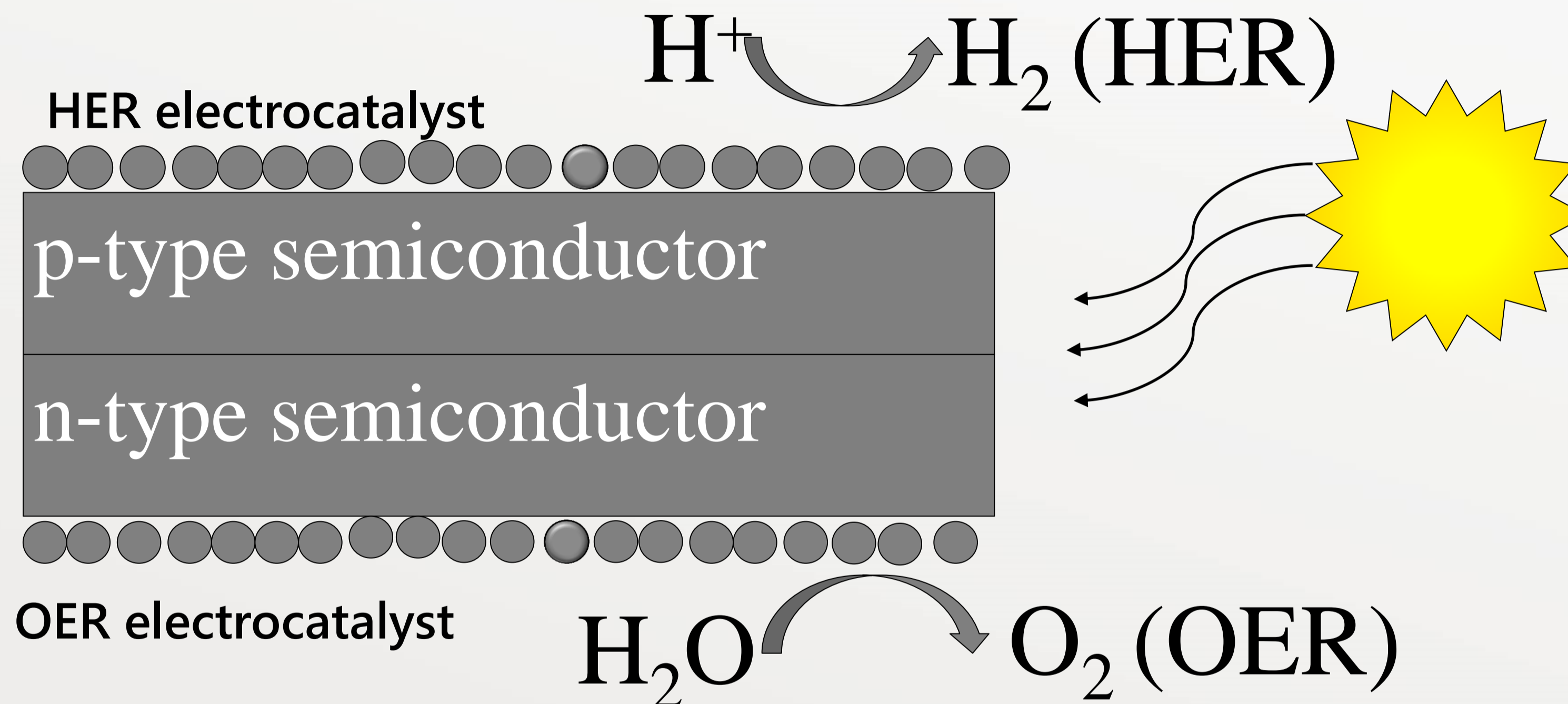


# Photoelectrode-Catalyst Couples for the Hydrogen Evolution Reaction

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## Motivation

- Hydrogen for energy and as chemical feedstock
- Dwindling fuel reserves
- Rising concentrations of  $\text{CO}_2$  in the atmosphere

# Material Aspects of PEC H<sub>2</sub> Production

Materials must be:

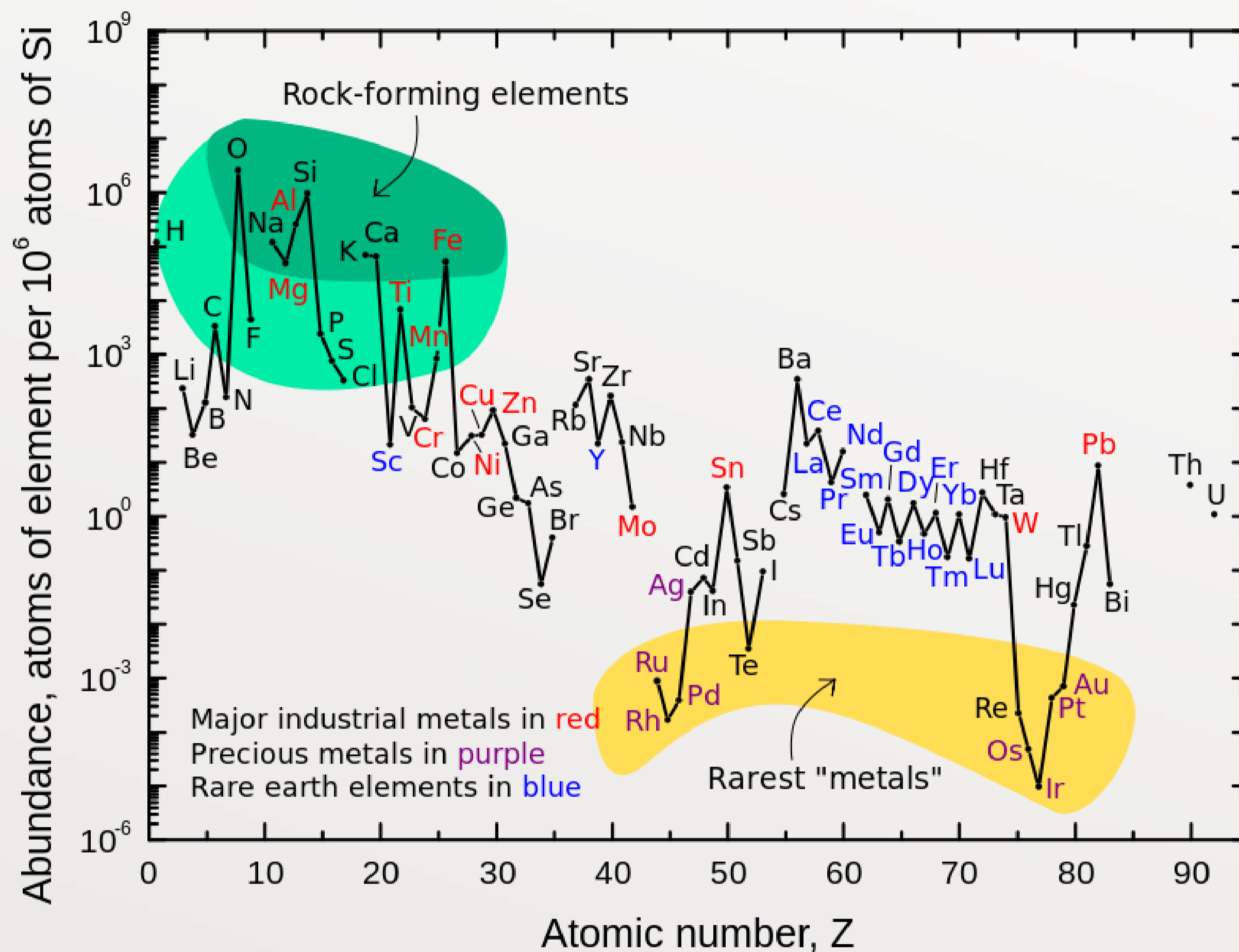
Cheap & Scalable – made from abundant elements

- Currently the best catalysts are Iridium oxide (OER) and Platinum (HER)

Stable and Mutually stable

Compatibility.

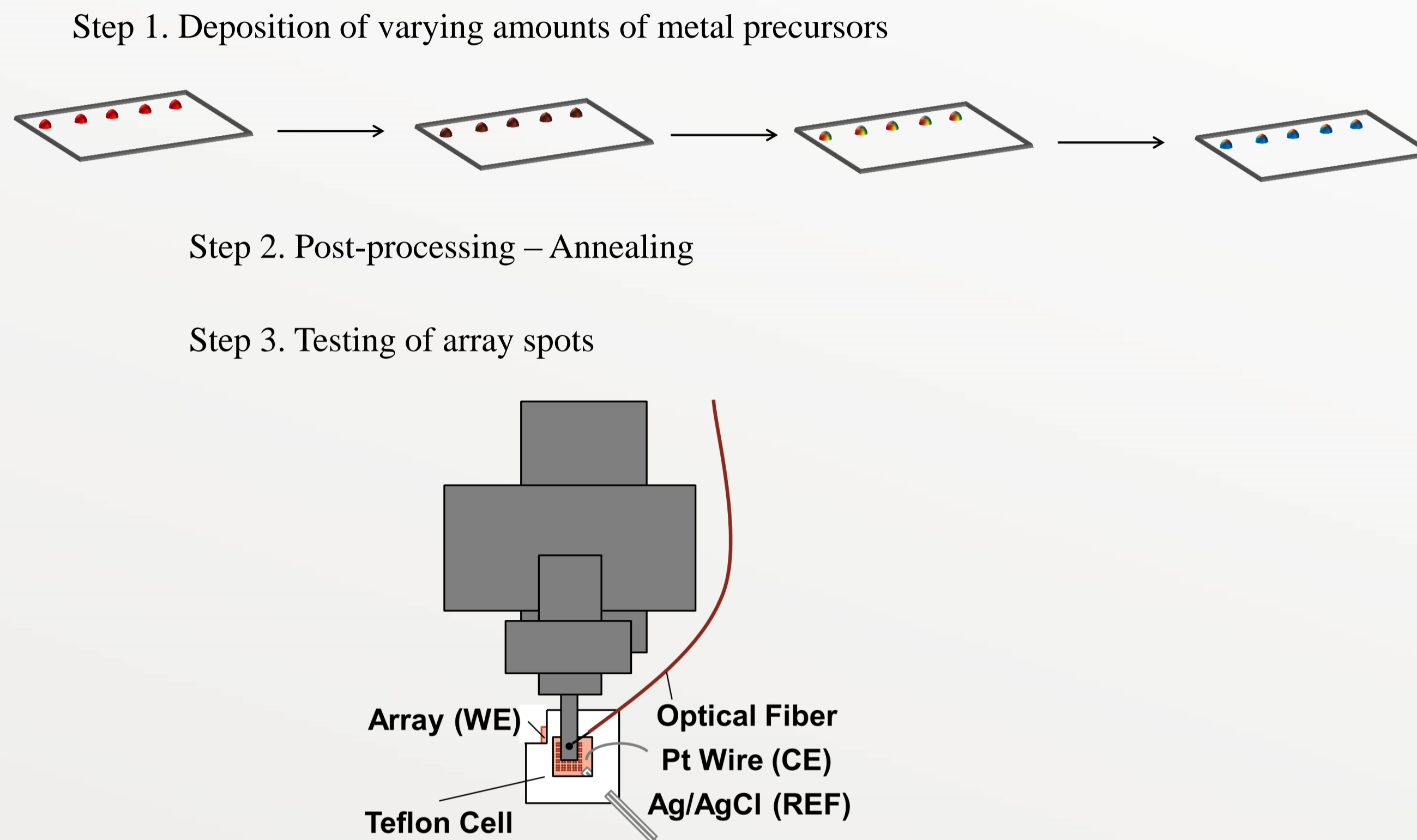
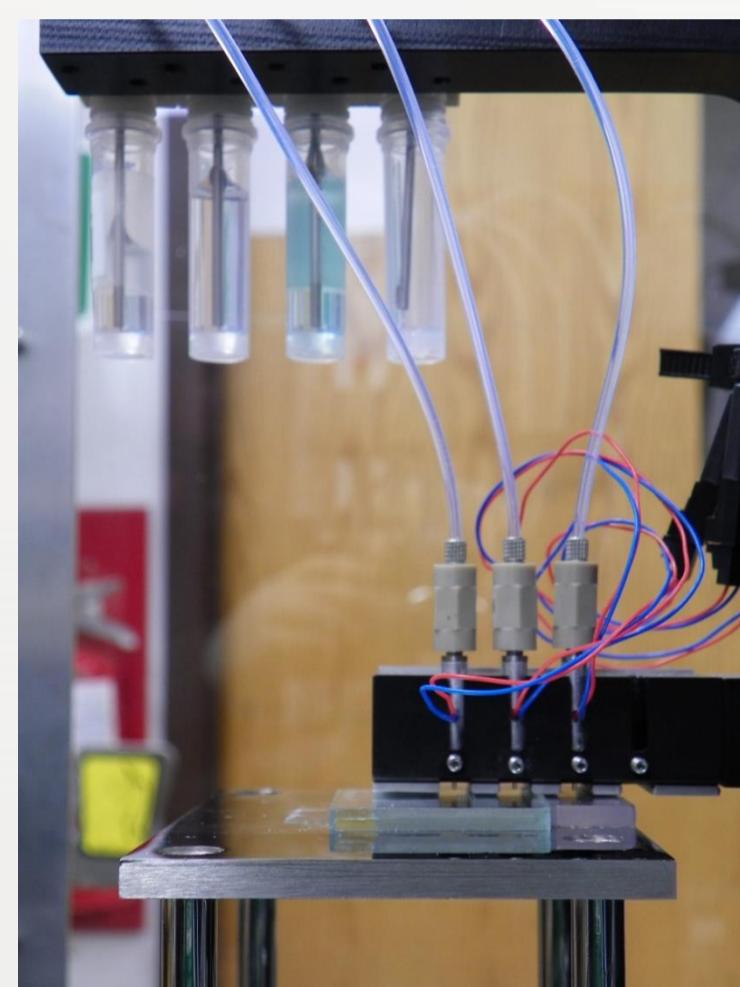
- For example, Iridium oxide, the best OER catalyst when coupled with a photoanode –BiVO<sub>4</sub> – does not yield the most efficient PEC oxygen evolution



# A Combinatorial Approach

Some known non-noble Metal Hydrogen Evolution Catalysts

**Ni-Mo**  
**Co-Ni-Mo**  
**Co-Mo-N<sub>x</sub>**  
**MoS<sub>2</sub>**  
**NiP**  
**Fe, Co, Ni doped MoS<sub>2</sub>**  
**Cu-Mo Sulfides...**



A capacity to study varying compositions for materials with up to four components.

Materials that can be studied include alloys, mixed oxides, mixed sulfides, mixed nitrides

By scanning on a silicon substrate, we are able to deal with the issue of compatibility of semiconductor/electrocatalyst couple



## Work done so far

