

Cost-effective Green Hydrogen

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Introduction **Growing Demand** Expensive Green H₂ 2% Green energy 20% Industrial 1% Methanol by-products 56% Natural Unit/Mt Gas 100 52.5 35.3 24.5 (kgCO₂/ 1975 1980 1990 2000 2010 2022 2030 Cost Breakdown of the PEM electrolyzer 53% 50% Bipolar Plates (BPs) 40% Porous Transport Laver (PTL) 30% Catalyst-coated Membrane (CCM) 24% Assambly 10% Other components

- 1. Despite growing demand, green hydrogen remains only ~2% of the total hydrogen supply.
- 2. High cost of green hydrogen hinders its economic viability, thus cost reduction is an urgent priority.

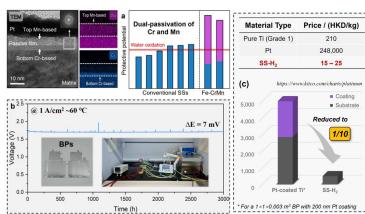
Methodology Traditional Design Advanced fabrication of SS-H₂ Passivation layer TiO₂(insulating) Pt (expensive) End Plate Bipolar Plate orous transport Layer Fe-based **HER** catalyst **OER** catalyst Sacrifice little activity Cheaper & active Equal stability Remain high stability Catalyst Coated Membrane Traditional Pt/C: ~500HKD/g Traditional IrO₂: ~2500HKD/g (CCM)

Objectives

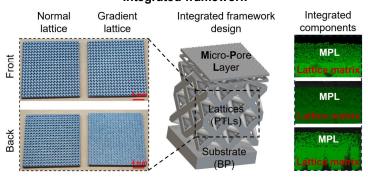
- 1. Replace the expensive Pt-cost Ti framework
- 2. Reduce interface contact resistance of framework
- 3. Design low-cost and efficient catalytic systems

Research achievement

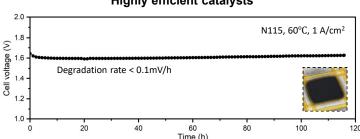
Low-cost stainless steel "SS-H₂"



Integrated framework



Highly efficient catalysts



Publications

- [1] K. P. Yu, M.X. Huang, et al, Materials Today (2023) 70.
- [2] K. P. Yu, M.X. Huang, et al, Corrosion Science (2025) 246
- [3] X. L. Chen, M.X. Huang, et al, Materials Today Sustainability (2025) 101185.
- [4] K.P. Yu, M.X. Huang, et al, Corrosion Science (2022) 208.