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Colorado Fuel Cell Center

CO₂-to-fuels through novel electrochemical catalysis

Federal funding: \$800,000

Cost share: \$200,000

Project duration: January 2019 – December 2020

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Federal Project Manager Sai Gollakota

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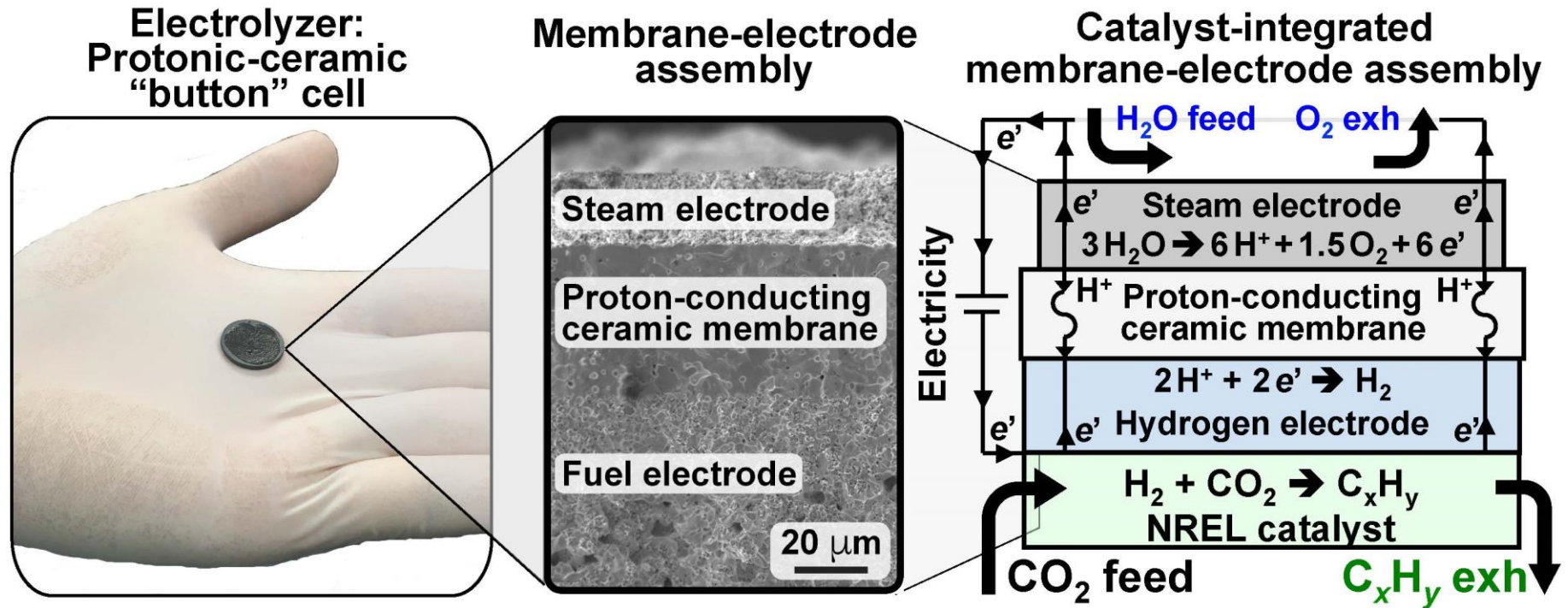


Objective: Integrate advanced catalysts with proton-conducting ceramic membranes for CO₂ upgrading



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Results: We have upgraded CO₂ + H₂ feed streams into drop-in fuels for natural gas pipelines

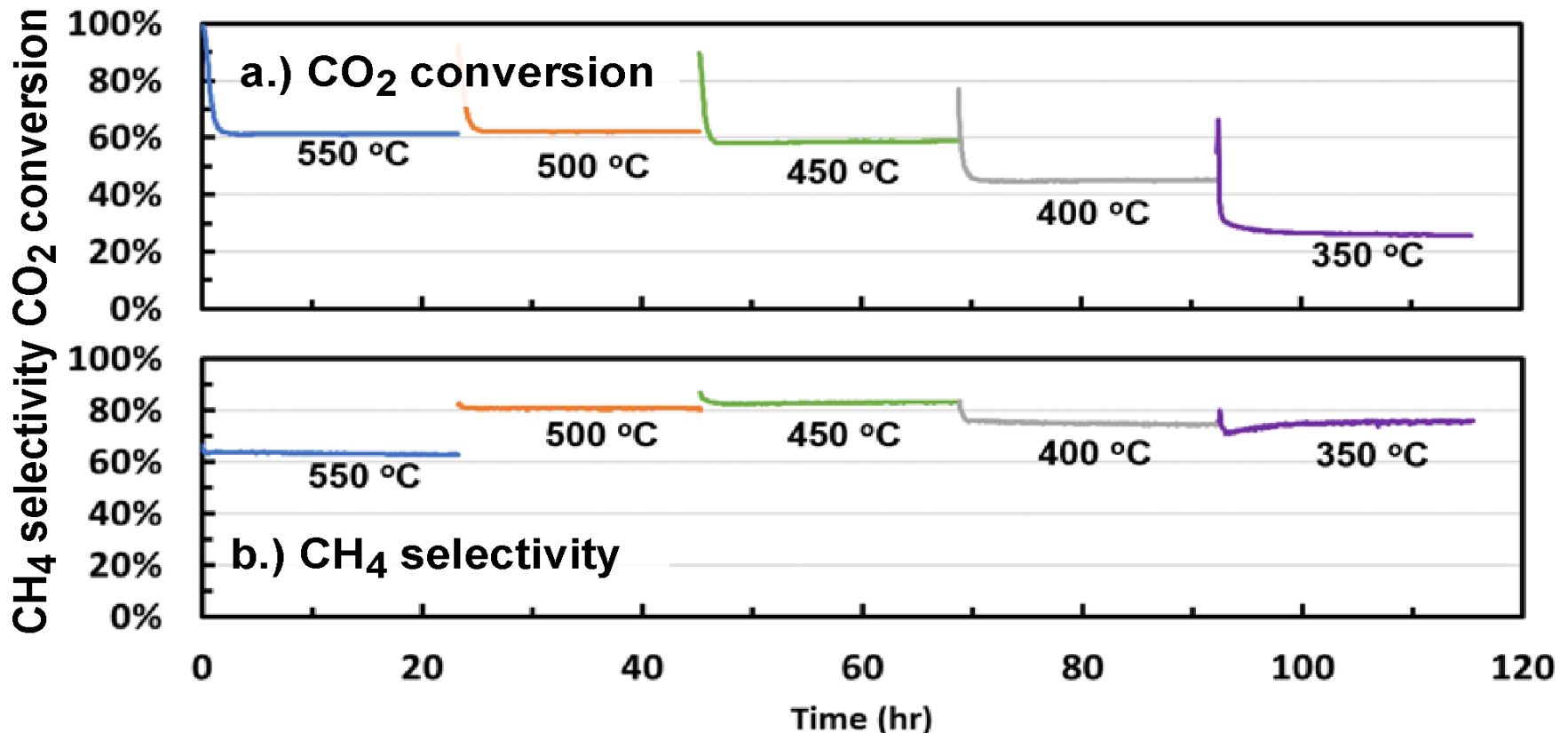


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Novel protonic-ceramic materials set

- Fuel electrode: **Ni** – BaCe_{0.4}Zr_{0.4}Y_{0.1}Yb_{0.1}O_{3-δ}, upgrade CO₂ to CH₄
- Ceramic membrane: BaCe_{0.4}Zr_{0.4}Y_{0.1}Yb_{0.1}O_{3-δ}, proton conduction
- Steam electrode: BaCo_{0.4}Fe_{0.4}Zr_{0.1}Y_{0.1}O_{3-δ}, electrolyze H₂O (future)



Results: We have upgraded CO₂ + H₂ feed streams into drop-in fuels for natural gas pipelines



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- **Stability of proton-conducting ceramics in high CO₂ is evident**
 - **Over 100 hours of continuous operation with no performance degradation**
- **Encouraging CO₂ conversion and CH₄ selectivity demonstrated**
 - **All tests to date reflect the zero-electrolysis “bound”**
 - **CO₂ conversion over 60% at 450 °C**
 - **CH₄ selectivity over 80% at 450 °C**

Going forward

- **Explore the other “bound” of Sabatier Electrolyzer**
 - **All hydrogen produced through electrolysis of H₂O**
- **Incorporate novel catalyst to produce high-carbon fuel**



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Thank you for your kind attention!

