

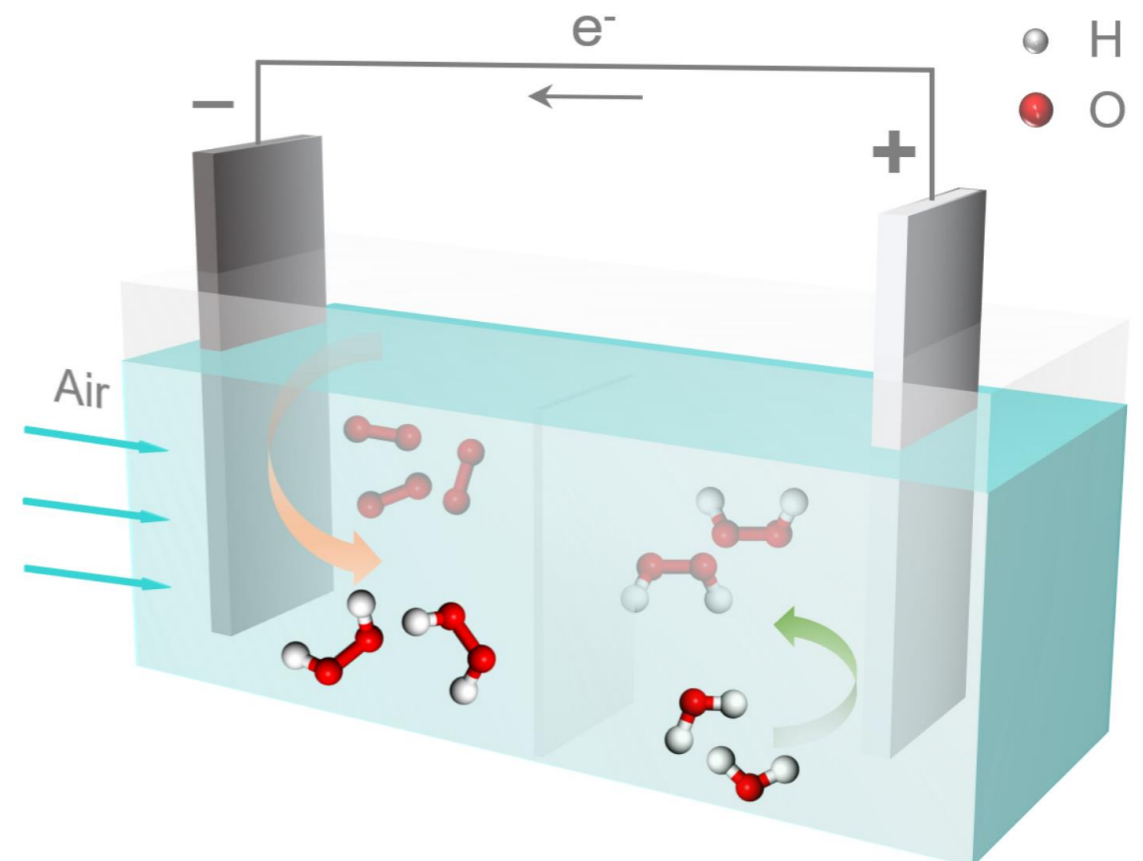
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Coupling functional anodes with natural air-diffused cathodes enables highly efficient hydrogen peroxide electrosynthesis

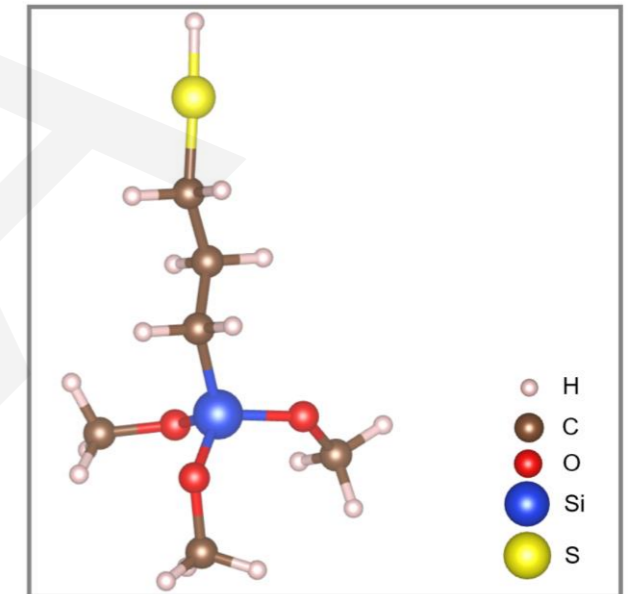
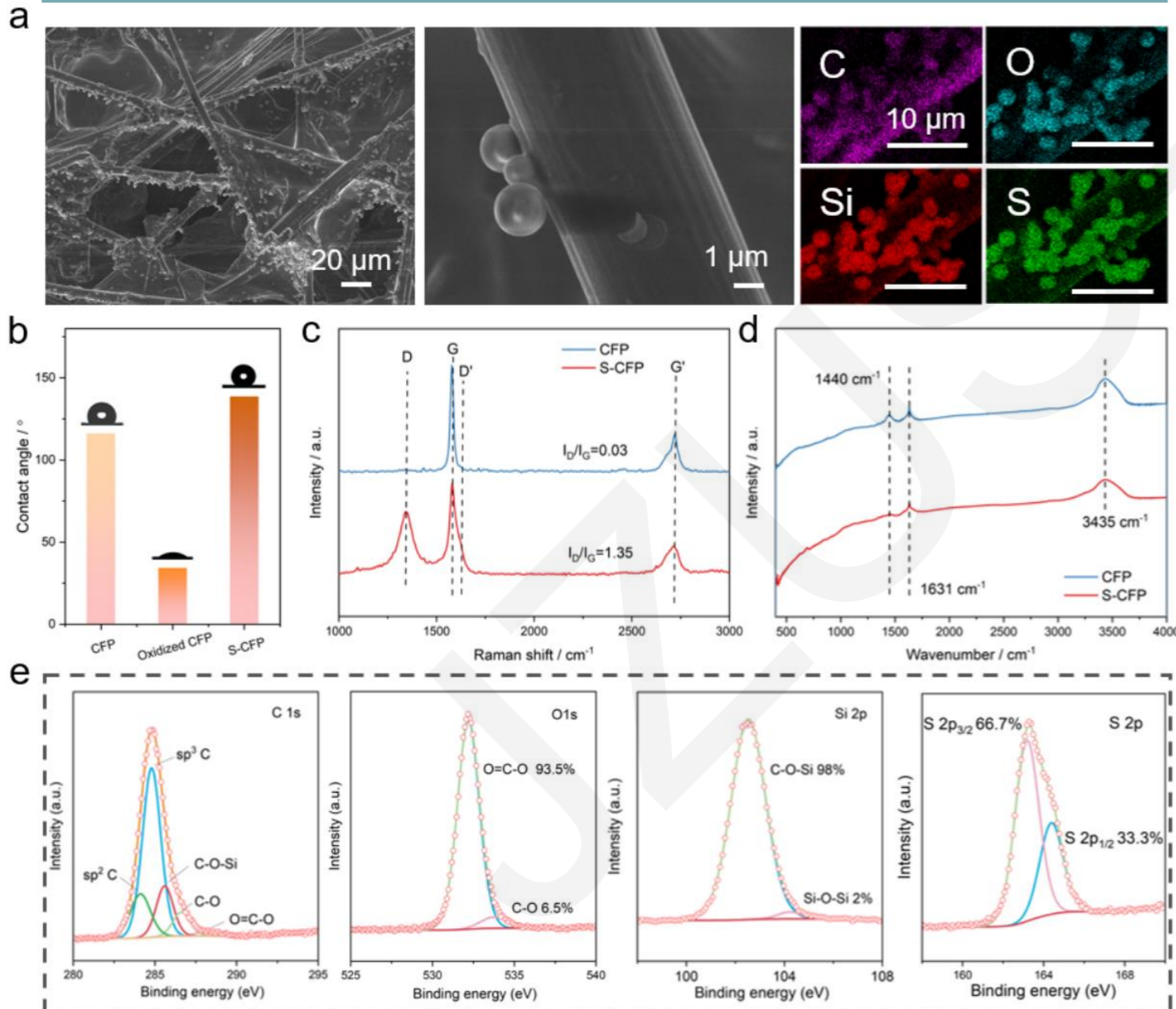
Key words:

Two-electron water oxidation
Two-electron oxygen reduction
Self-assembled membrane
Hydrogen peroxide
Electrosynthesis



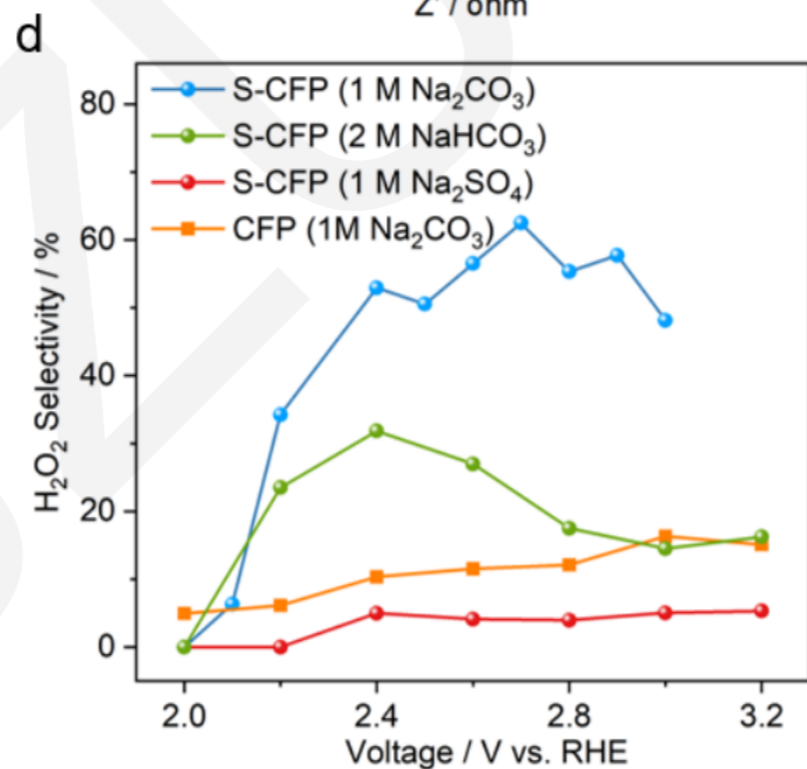
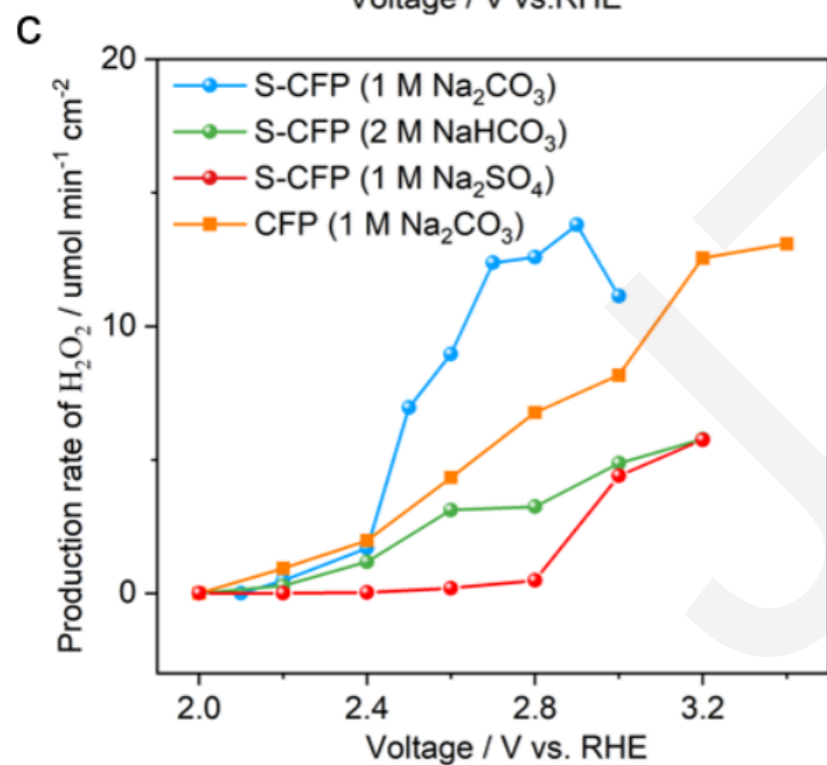
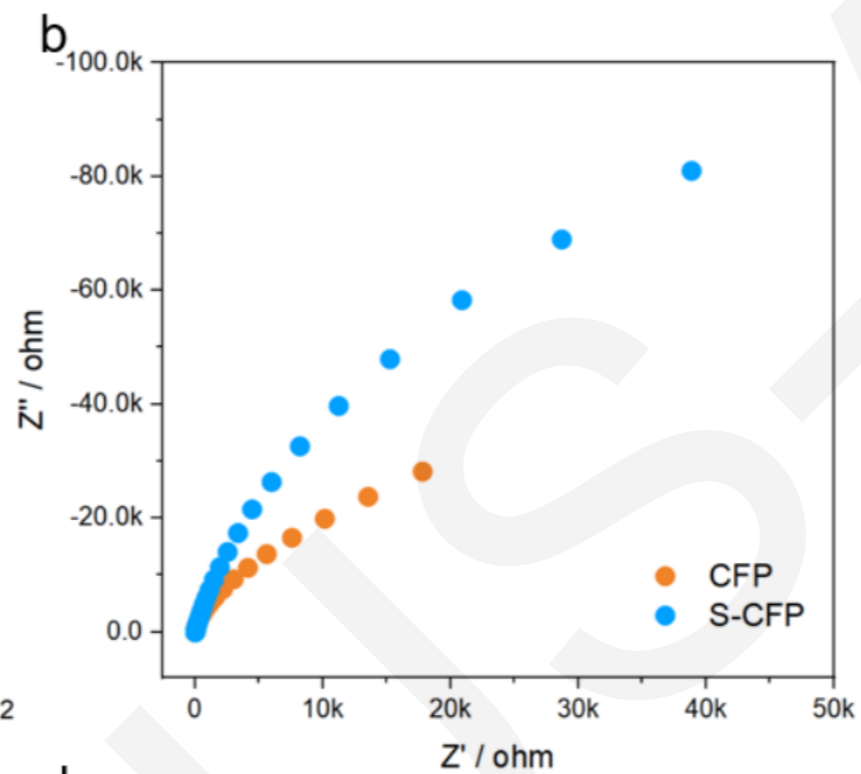
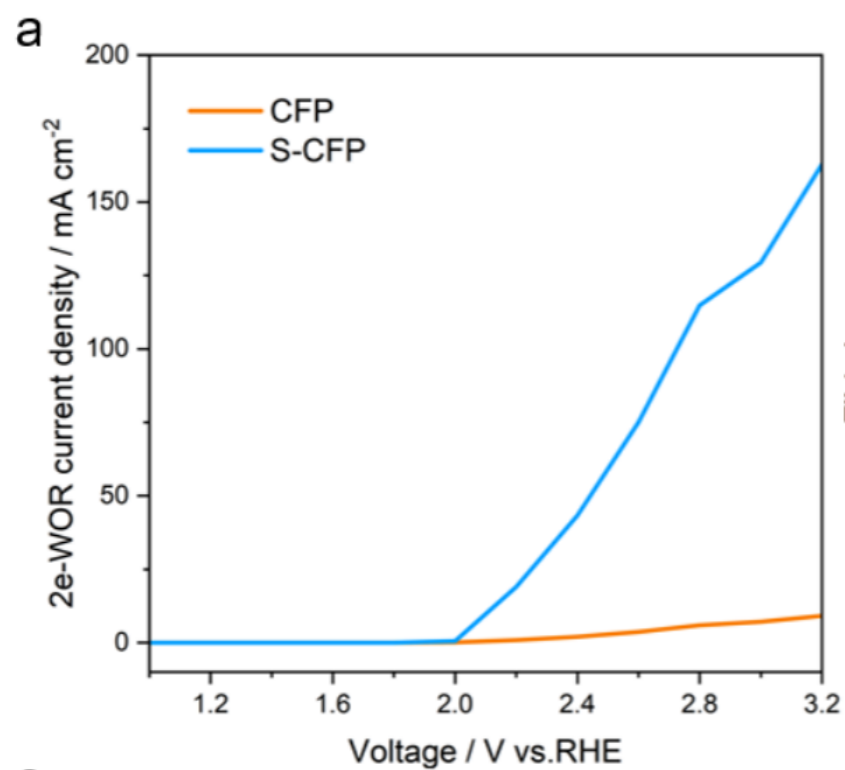
Functional anodes

Characterization



- 3-Mercaptopropyltriethoxysilane modified
- porous
- Hydrophobic
- C-O-Si
- COOSi

Performance of anodes

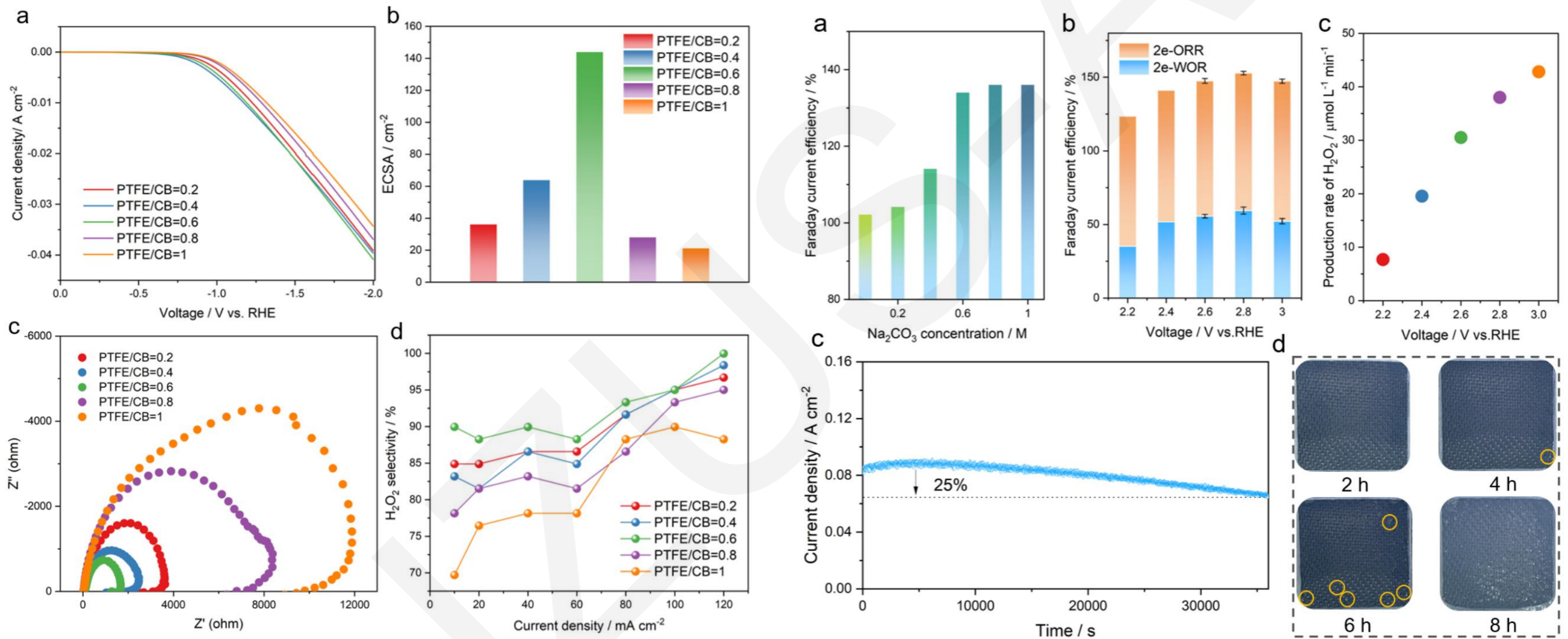


- Production rate:
12.6 μmol/(min·cm²)
- Selectivity 62.1%
- CO₃²⁻/HCO₃⁻ is essential

Performance of cathodes and anodes

Cathodes

Coupled system



- Substrate: carbon cloth
- Catalyst: PTFE/CB=0.6

- Production rate: $38 \mu\text{mol/min}$
- Selectivity: 152.9%

Research Priorities and Perspectives

Research Priorities

- An modified anode for H_2O_2 electrosynthesis was prepared.
- A natural air-diffused cathode was prepared to combine with the modified anode.
- The total current efficiency reached 152.9%, and the H_2O_2 production rate was as high as 38 $\mu\text{mol}/\text{min}$ at 2.8 V vs. RHE.

Perspectives

Electrochemical synthesis of H_2O_2 is a distributed production method with great application prospects. However, the current efficiency of electrochemical synthesis of H_2O_2 based on cathode two-electron oxygen reduction (2e-ORR) or anode two-electron water oxidation (2e-WOR) is generally low. Therefore, coupling 2e-WOR and 2e-ORR to construct synchronous electrochemical formation technology for the anode and cathode is expected to double the current efficiency, greatly improve the synthesis rate and concentration of H_2O_2 .