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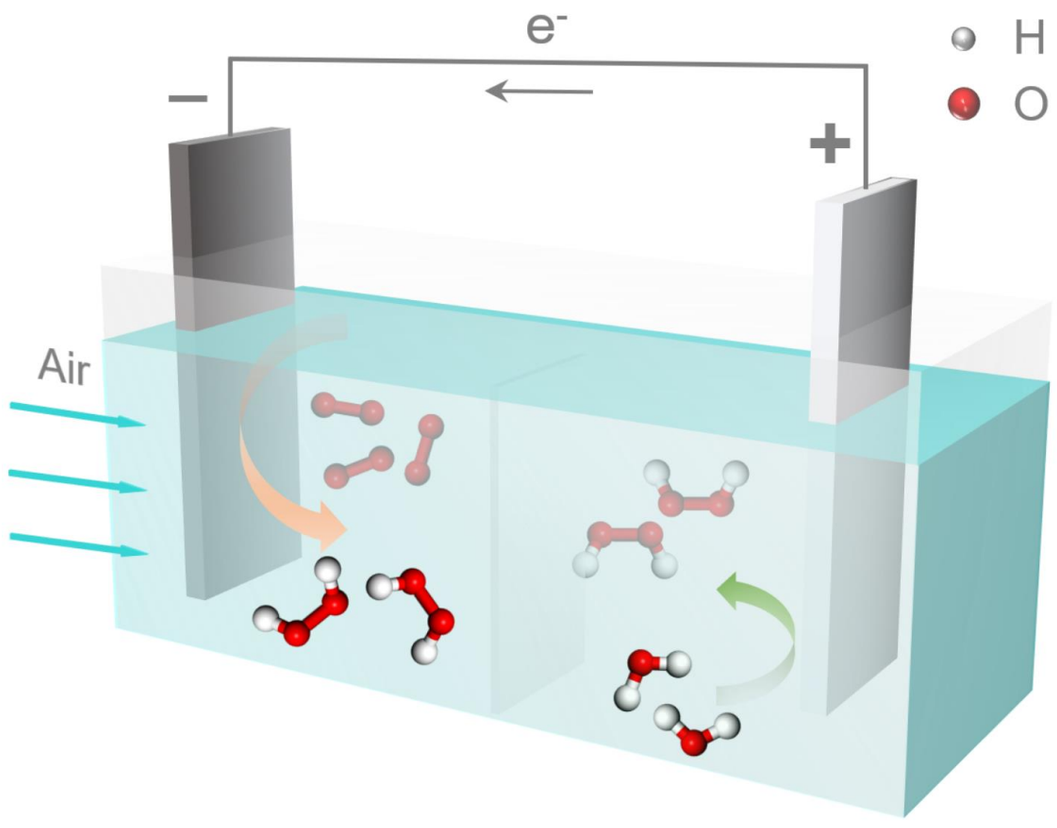
Coupling functional anodes with natural air-diffused cathodes enables highly efficient hydrogen peroxide electrosynthesis

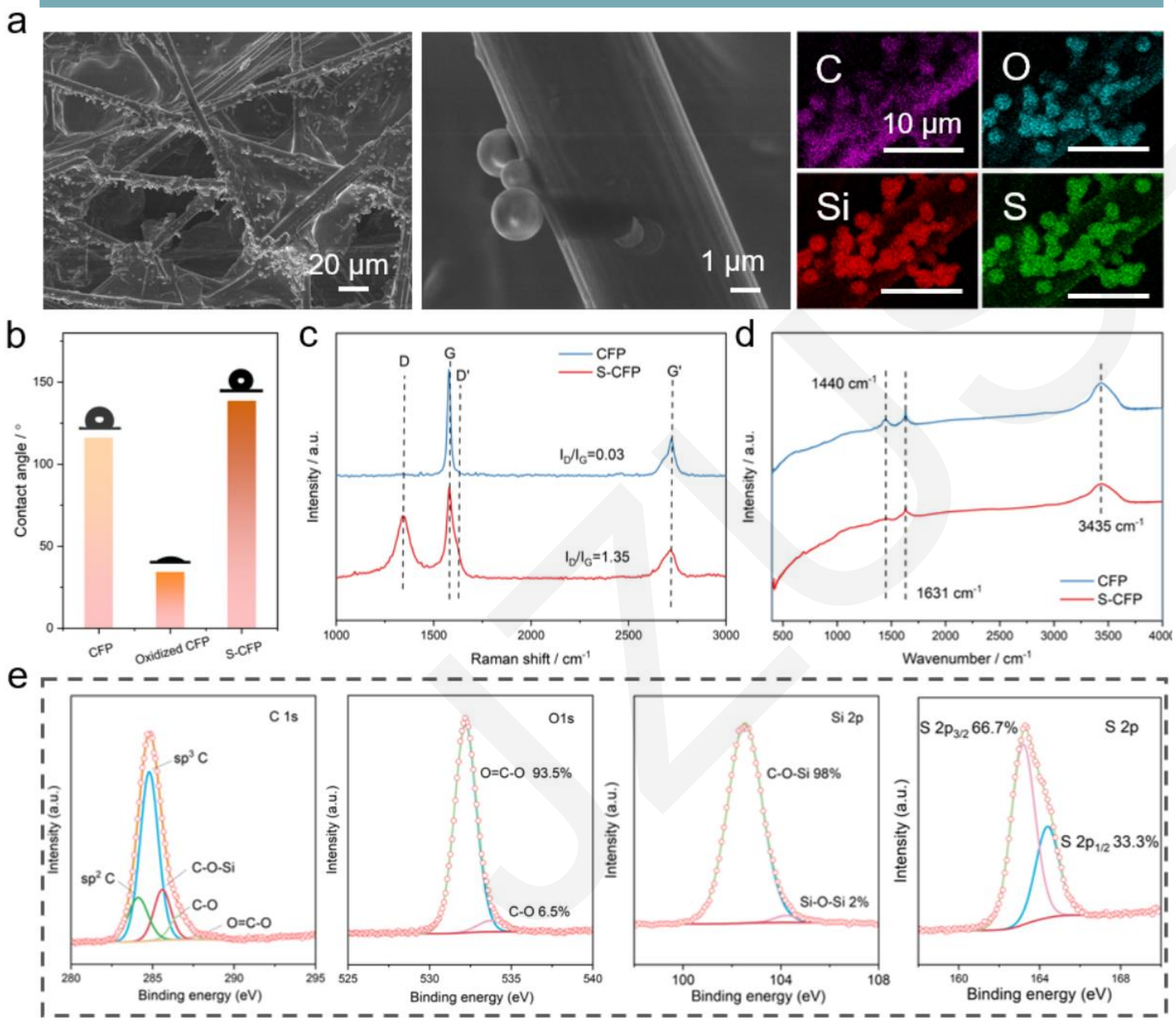
Key words:

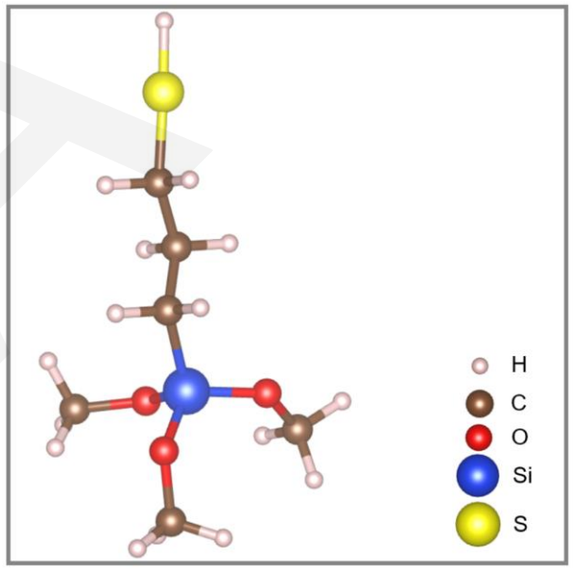
Two-electron water oxidation
Two-electron oxygen reduction
Self-assembled membrane
Hydrogen peroxide
Electrosynthesis



Functional anodes

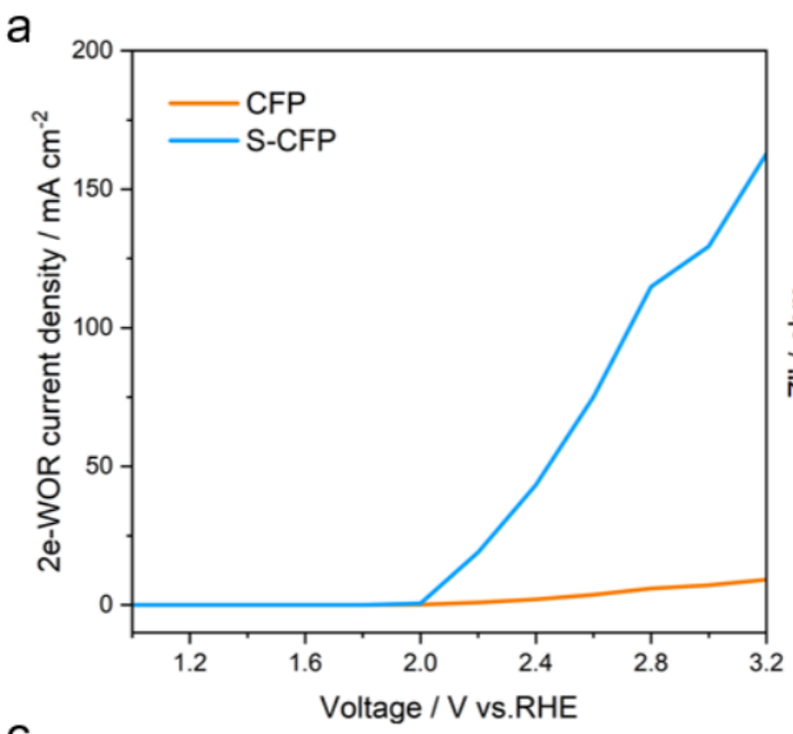
Characterization

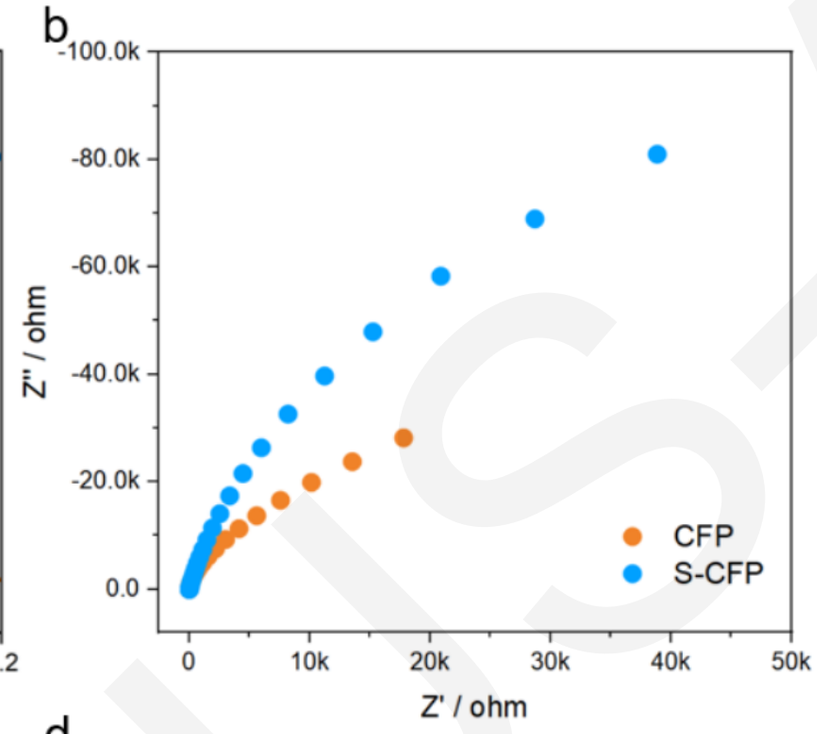




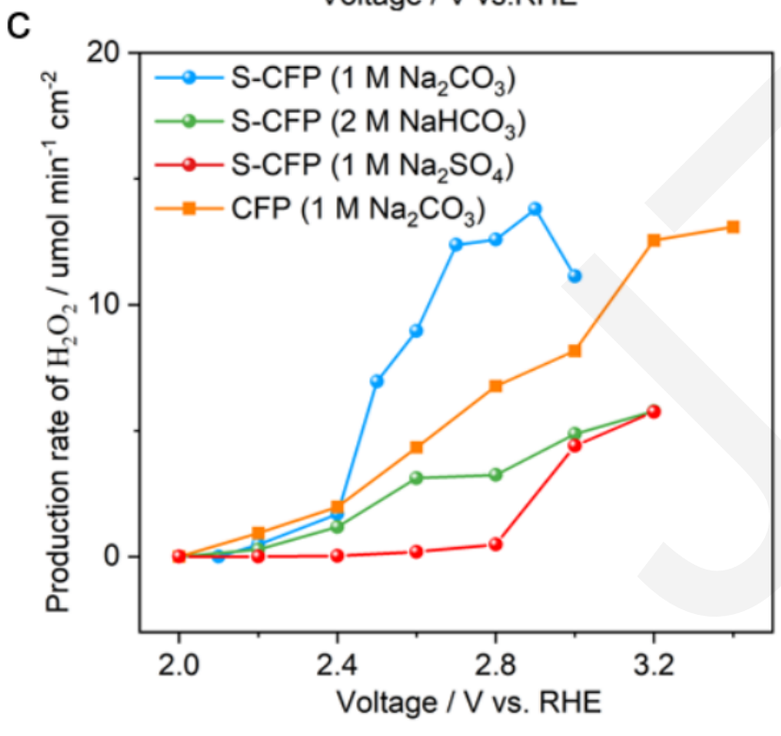
- 3-Mercaptopropyltrie-thoxysilane modified
- porous
- Hydrophobic
- C-O-Si
- COOSi

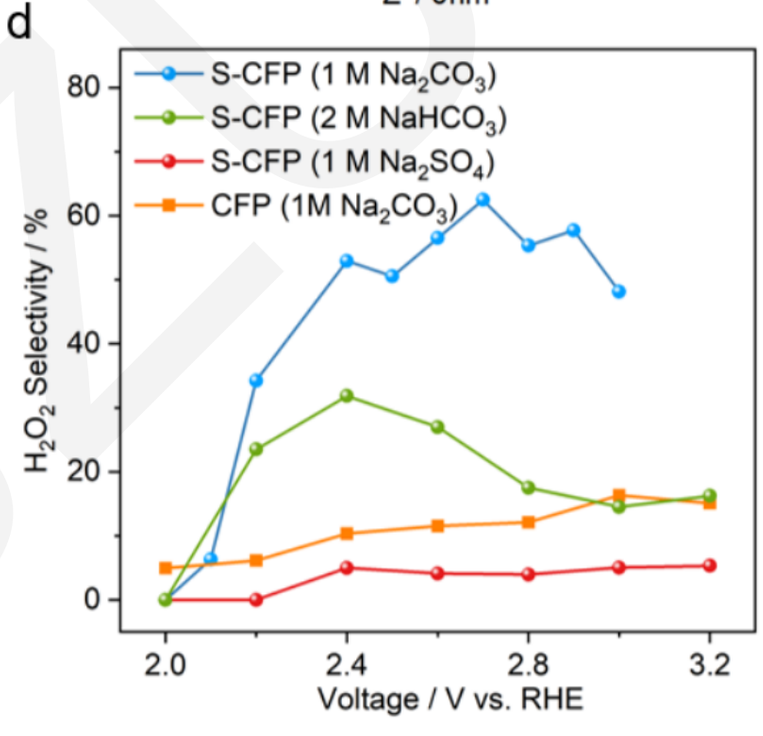
Performance of anodes









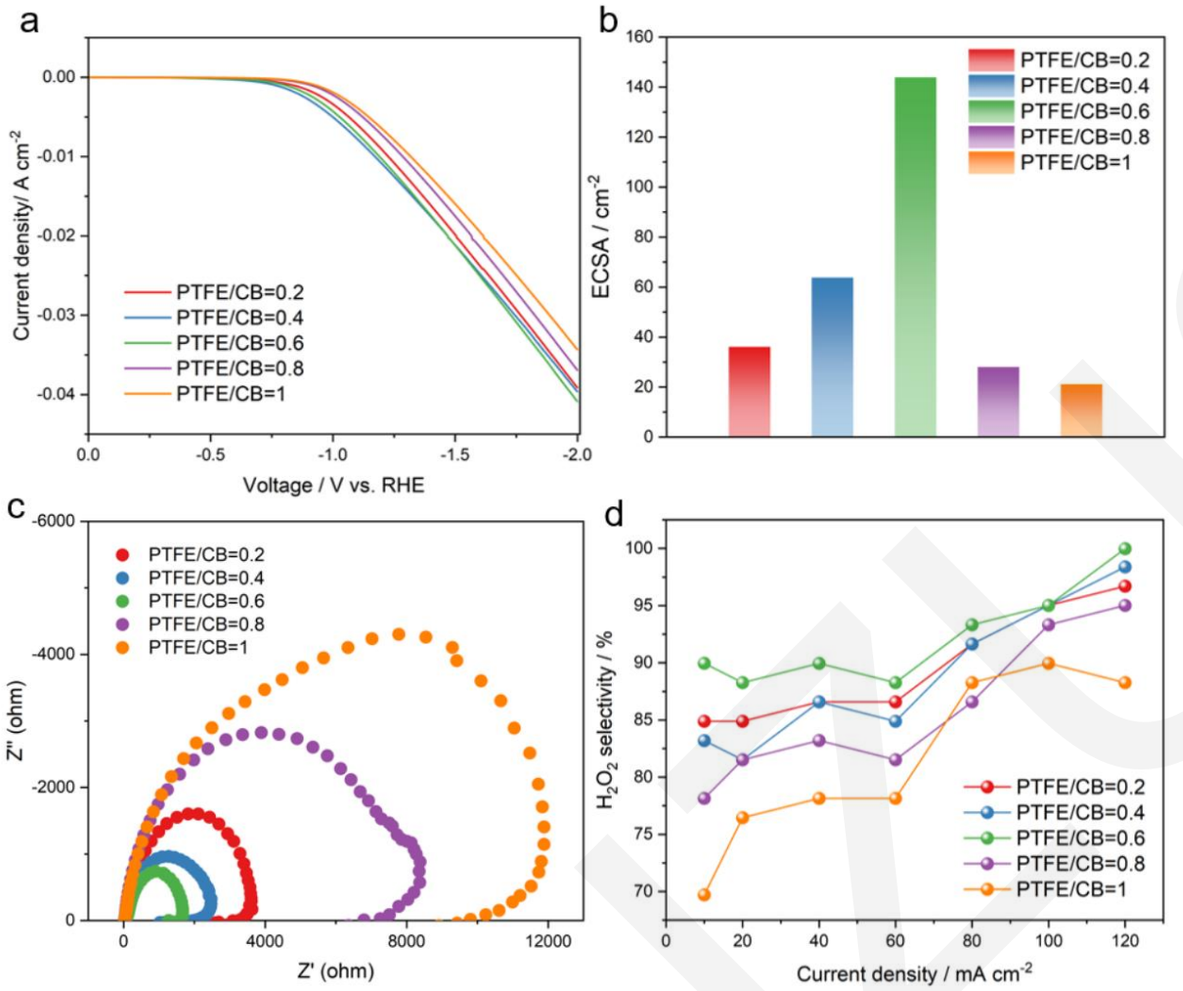


- Production rate:

  12.6 μmol/(min·cm^2)
- Selectivity 62.1%
- CO_3^{2-}/HCO_3^- is essential

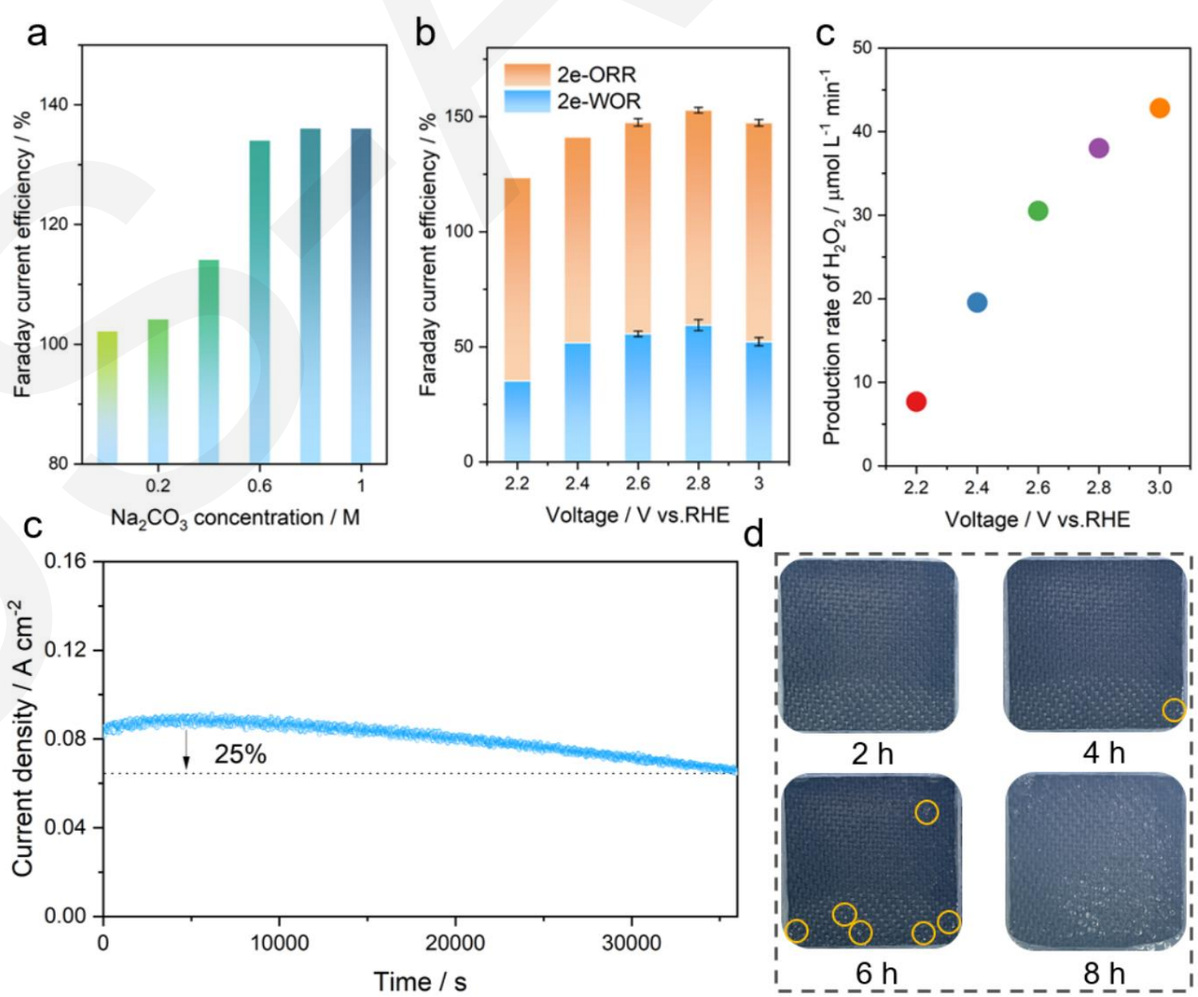
Performance of cathodes and anodes

Cathodes



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

Coupled system



- Production rate: 38 μmol/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 μmol/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.