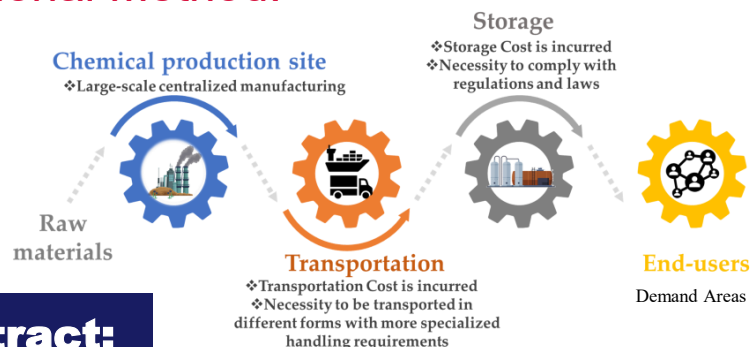


On-site Production of Key Chemicals for Climate-neutral Water Treatment

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Traditional Method:



Abstract:

Electrochemistry offers a climate-friendly alternative for producing water treatment agents such as hydrogen peroxide (H_2O_2) and ozone (O_3), which are normally made through energy-intensive methods. By generating these reactive substances electrochemically from water and oxygen, this approach avoids the need for transport and storage while reducing environmental impact. The challenge lies in improving efficiency and selectivity, which this project addresses by developing low-cost catalysts, optimizing electrolyzer parameters, and scaling up to an industrially relevant cell design. The ultimate goal is to integrate this technology into water treatment systems for sustainable, on-site production of key chemicals for climate-neutral water treatment.

Novelty

- ✓ Low-cost **carbon catalyst** for H_2O_2 electrochemical production from O_2
- ✓ Structurally-engineered **Pb-based catalyst** to boost Ozone production
- ✓ Scaled-up **electrolyzer prototype** with reaction surface area $> 40\text{cm}^2$

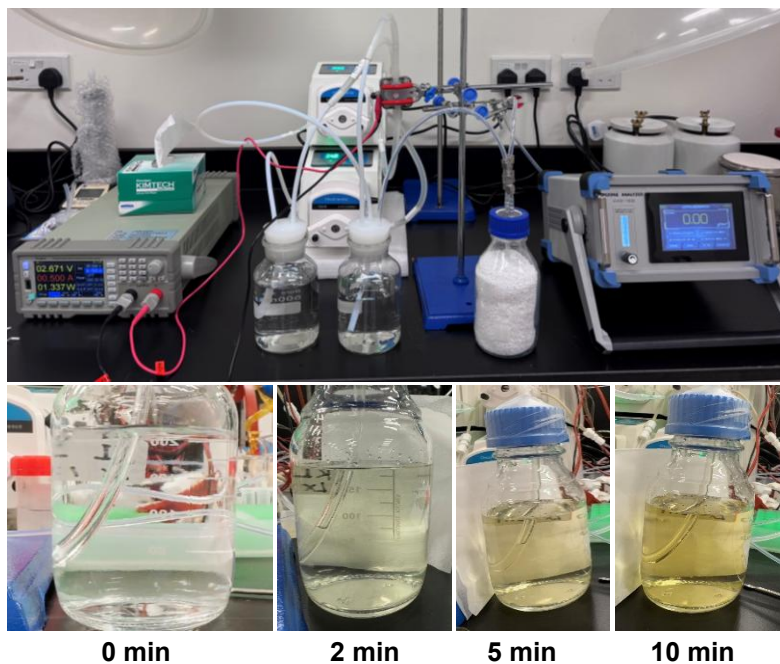


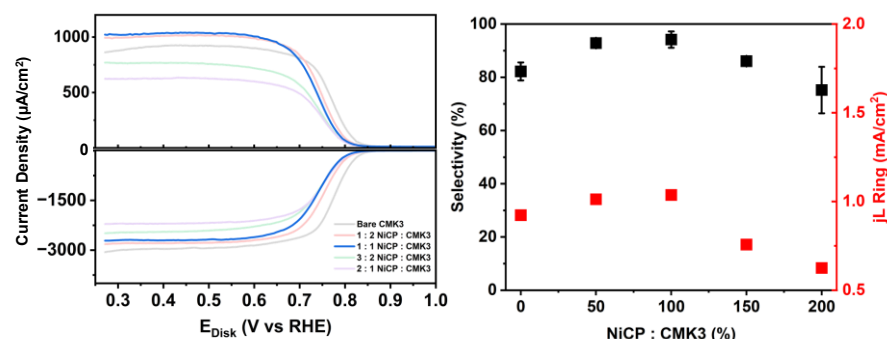
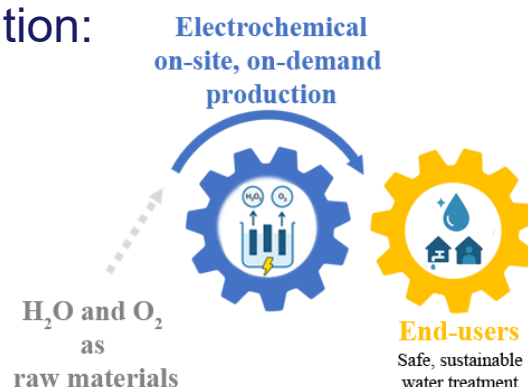
Fig 2. Pictures of ozone generator setup. The resulting ozone oxidizes I^- into I_2 in the ozone absorber solution, resulting in the yellow coloration overtime.

Intellectual Property:

- An Approach Of Hydrogen Peroxide Production In A Three-Chamber Reactor (NTU-Ref 2025-146)

Our Solution:

VS



H_2O_2 and Ozone for Water Treatment

Advantages:

- **Strong oxidizing agents** – effectively removes contaminants, organic matter, and microorganisms.
- **Environmentally friendly** – breaks down into water (H_2O) and oxygen (O_2), leaving no harmful residues.

Electrochemical production method

Advantages:

- Avoids transport and storage of reactive chemicals.
- Uses only water and oxygen as inputs, reducing carbon footprint.
- Allows direct integration to water treatment systems for continuous operation.
- Reduced supply chain dependence on centralized plants.

Publication

- Phase shuttling-enhanced electrochemical ozone production. EES Catalysis. **1**, 301–311 (2023)