

Improving anaerobic fermentative performance of food waste by Fe-modified biochar: FeBC synthesis and application in fermentation system

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Campus for Research Excellence and Technological Enterprise (CREATE)

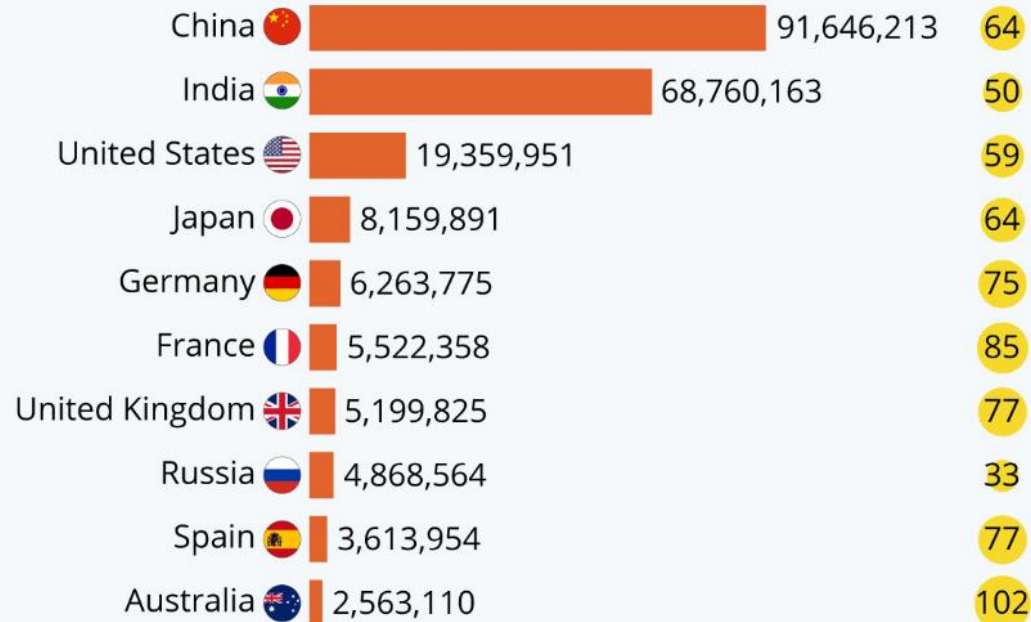
Background

The Enormous Scale of Global Food Waste

Total annual household food waste produced in selected countries*



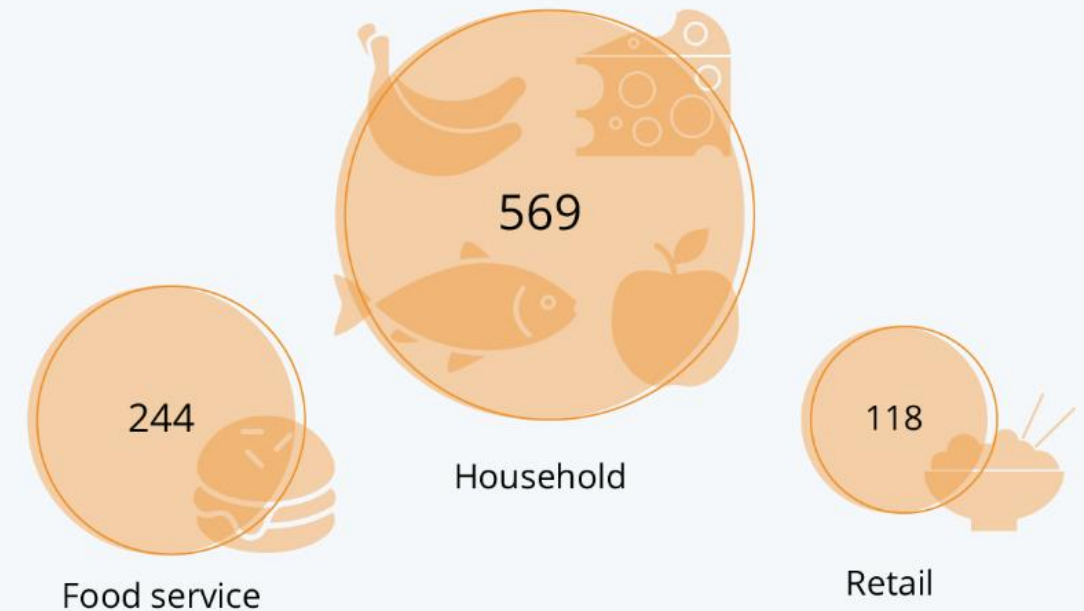
- Total food waste per year (tonnes)
- Estimated food waste per capita (kg)



* UNEP estimates with high or medium confidence
Source: UNEP Food Waste Index Report 2021

Food Waste Is Becoming A Billion Tonne Problem

Estimated annual global food waste by sector (million tonnes)



Source: UNEP Food Waste Index

Background



Landfill

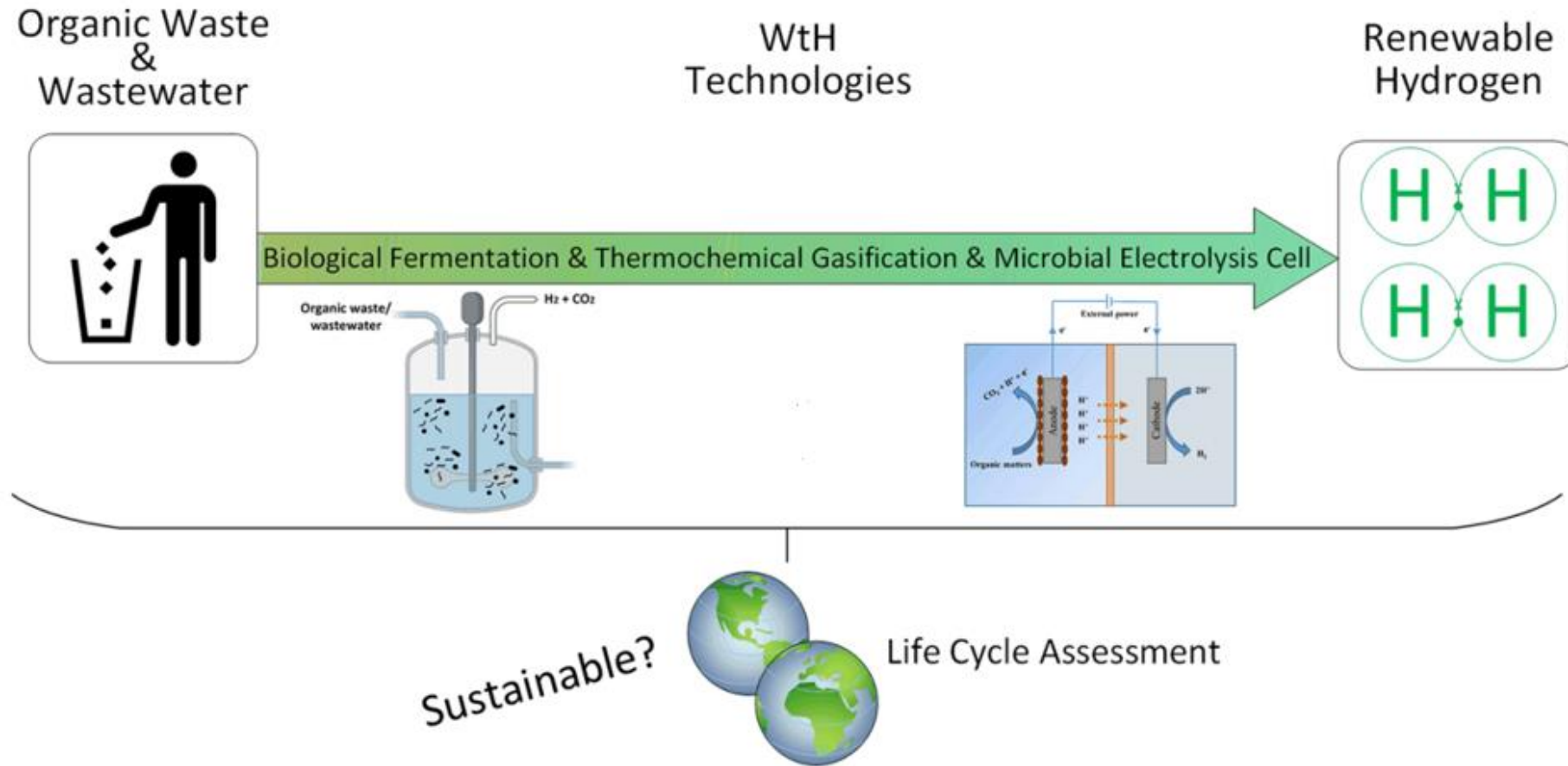


Incineration

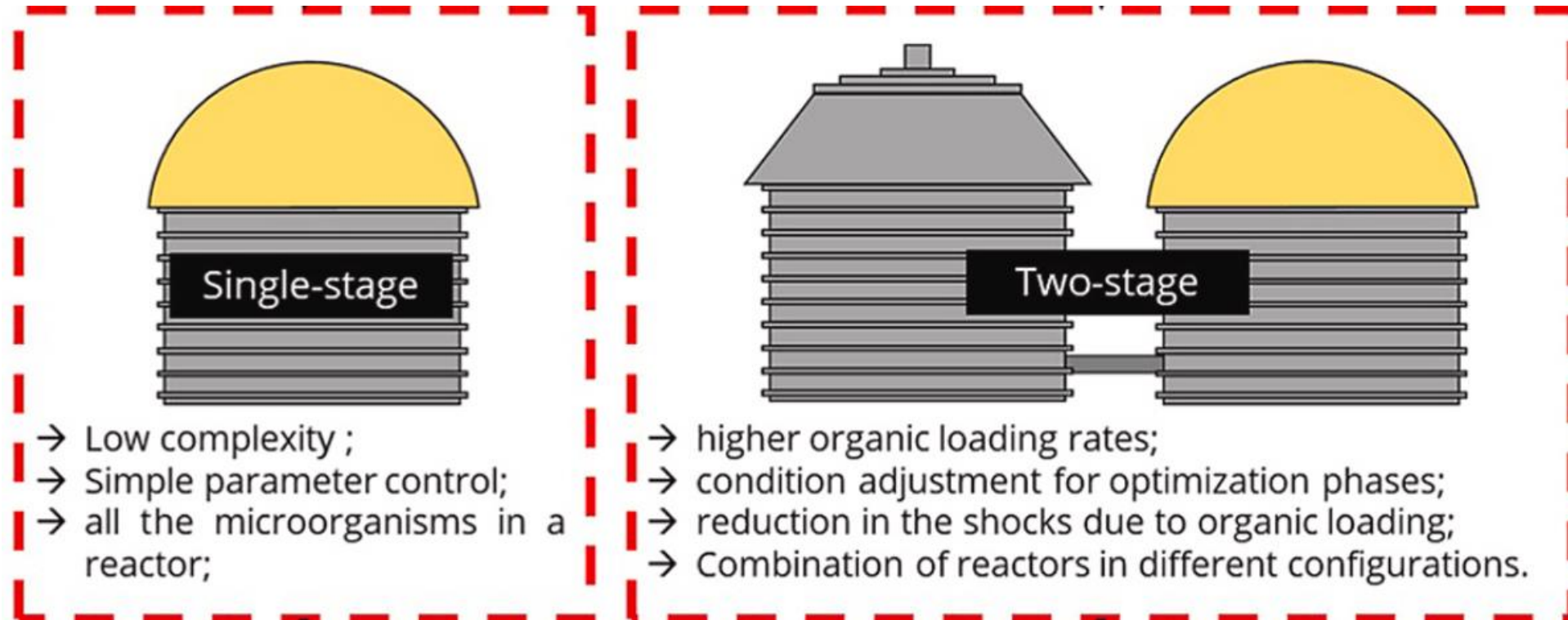


Compost

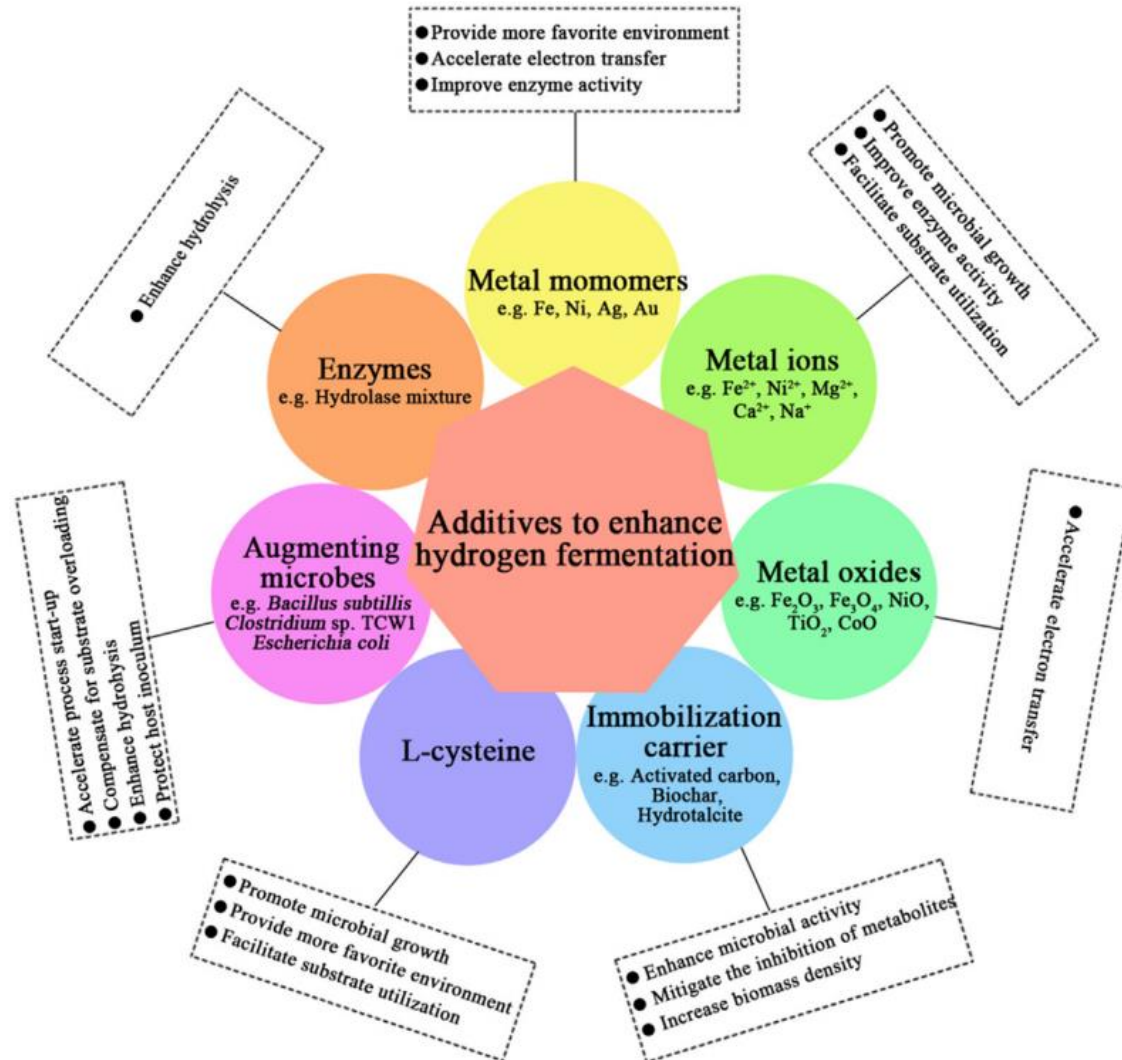
Background



Background



Background



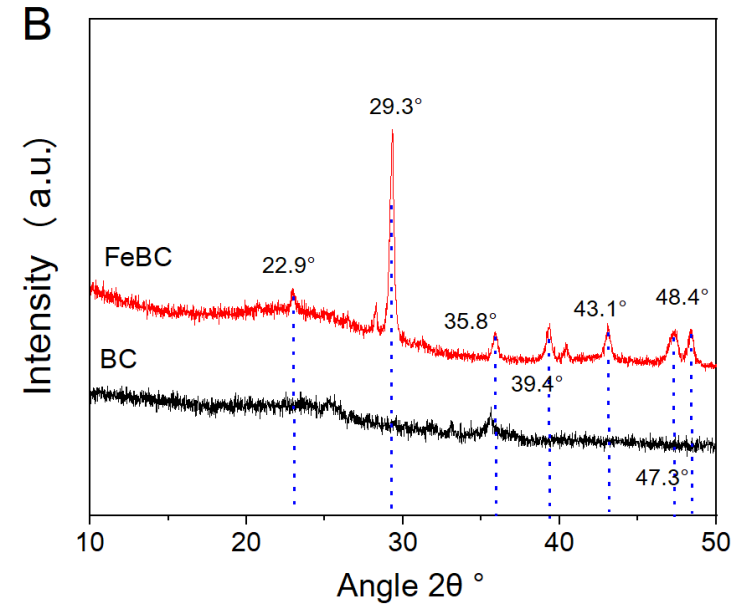
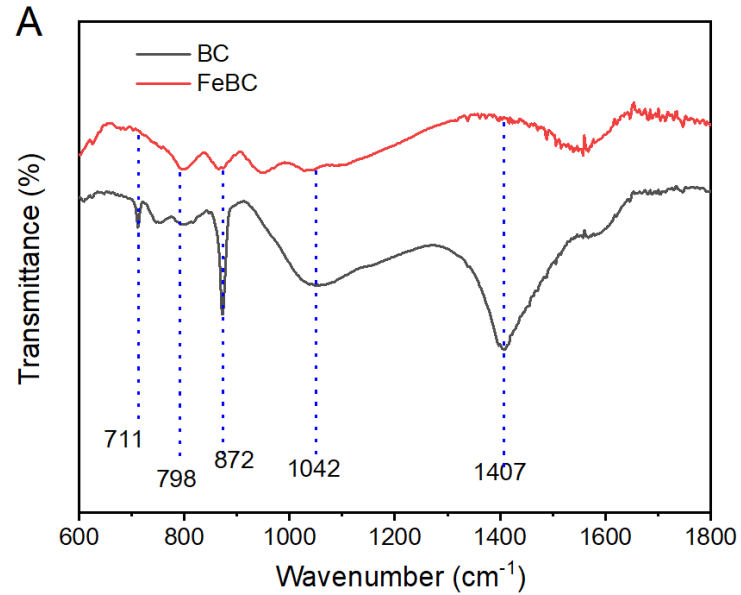
Carbon
materials

- Enhancing microbial growth
- Aggregating anaerobes
- Supplementing nutrients
- Promoting electron transfer
- Improving enzyme activity
- Buffering system pH

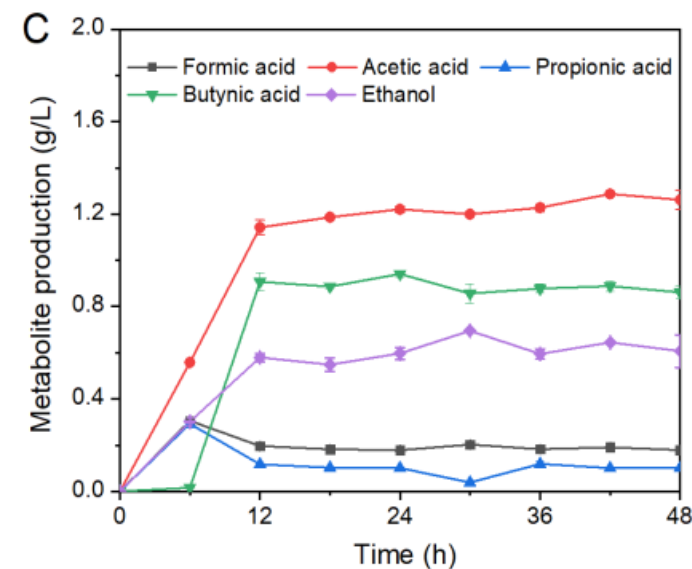
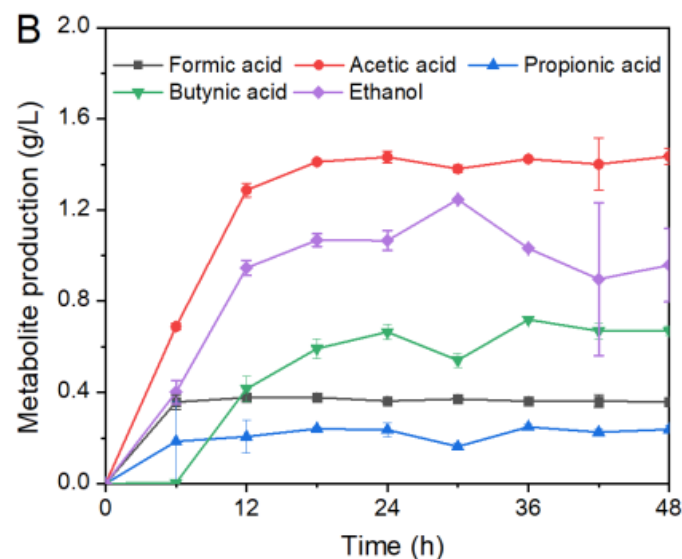
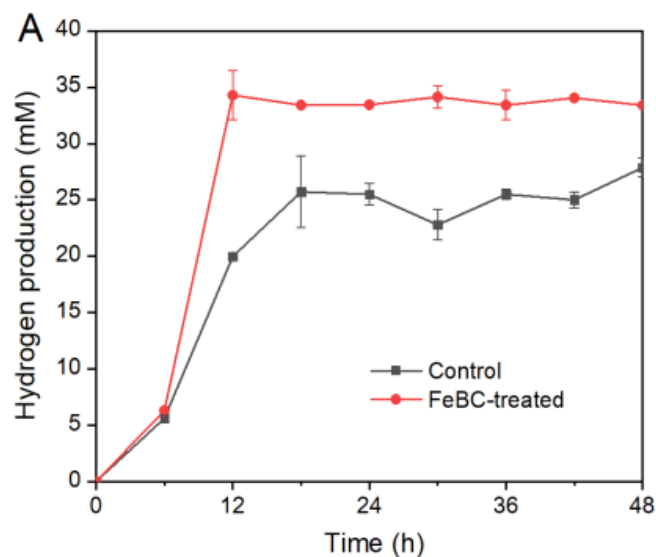
Challenges

- The efficiency of anaerobic fermentation of food waste to produce H_2/CH_4 needs to be improved
- Effect of Fe-modified biochar on anaerobic fermentation remains unclear
- The recyclability of iron-based biochar has not been studied well

Findings & Discussions

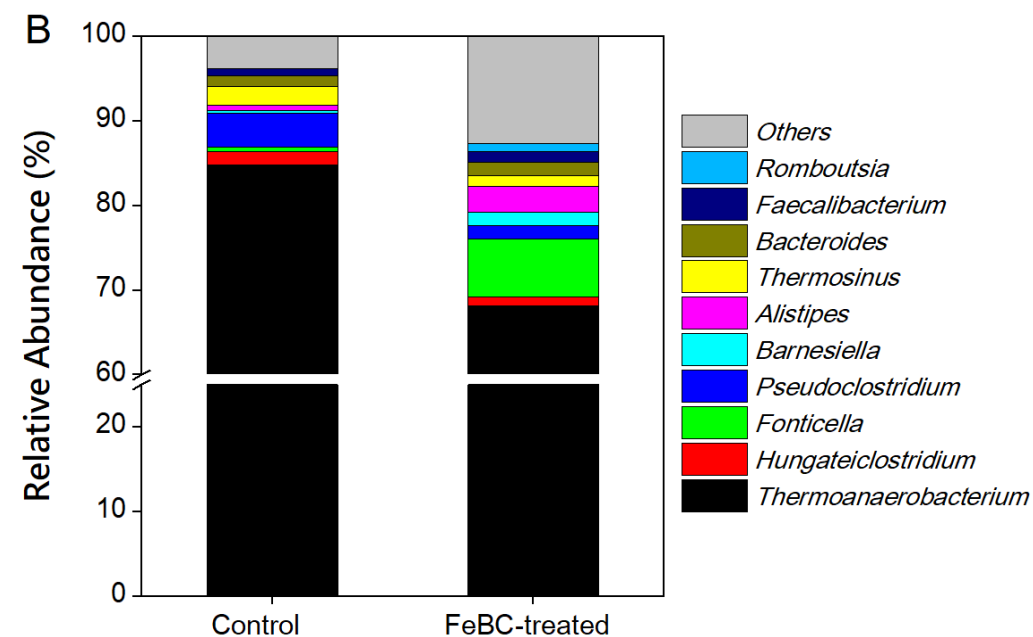
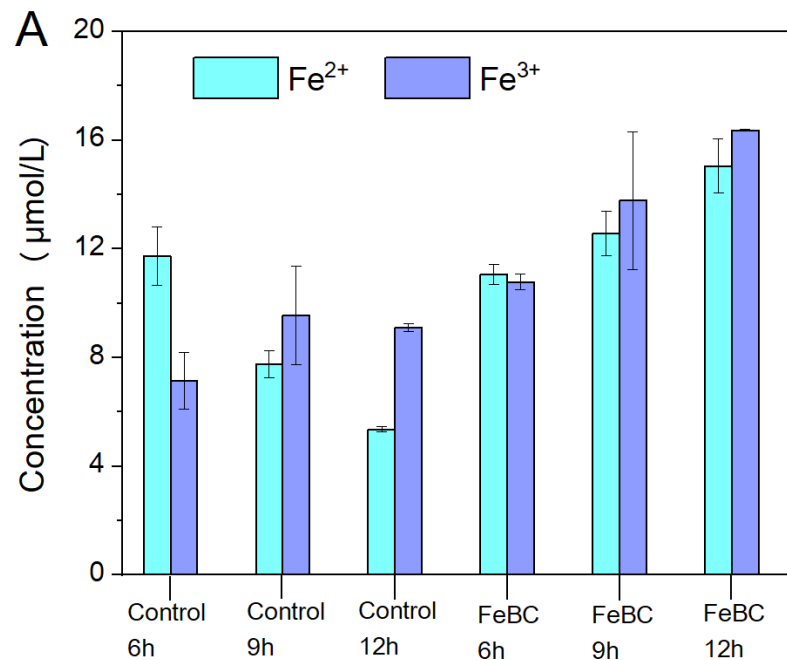


Findings & Discussions

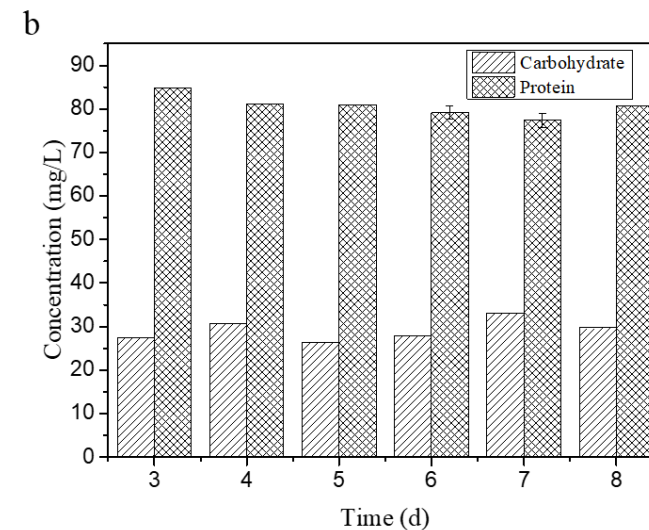
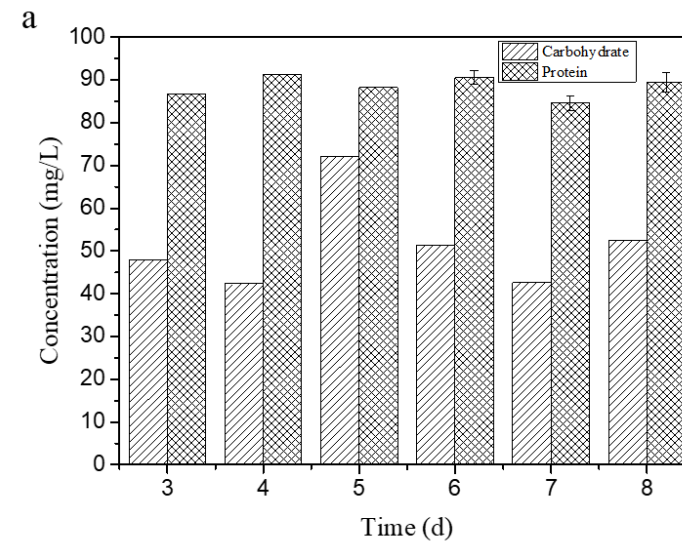
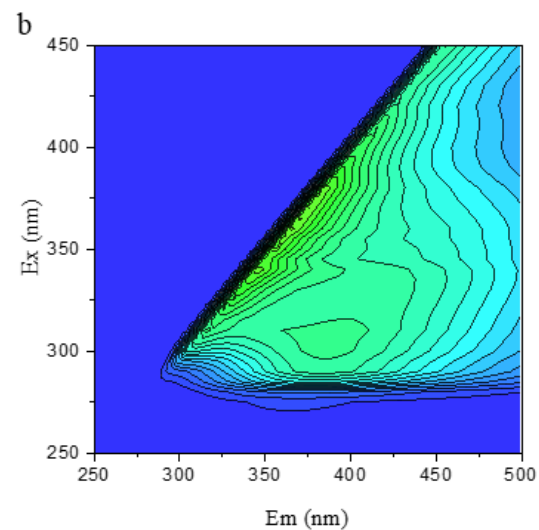
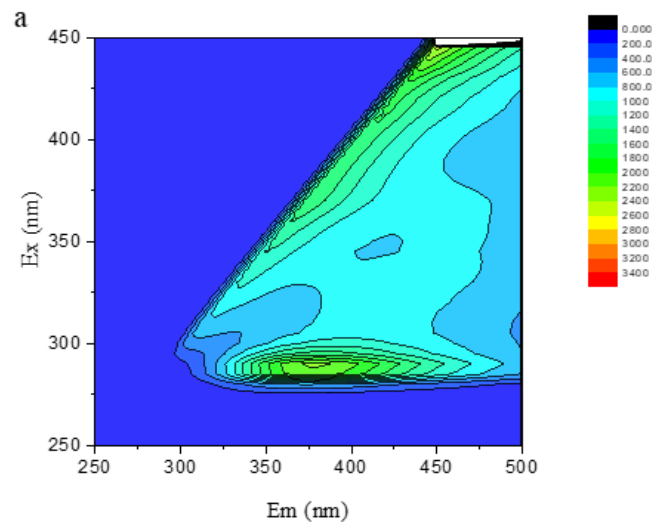
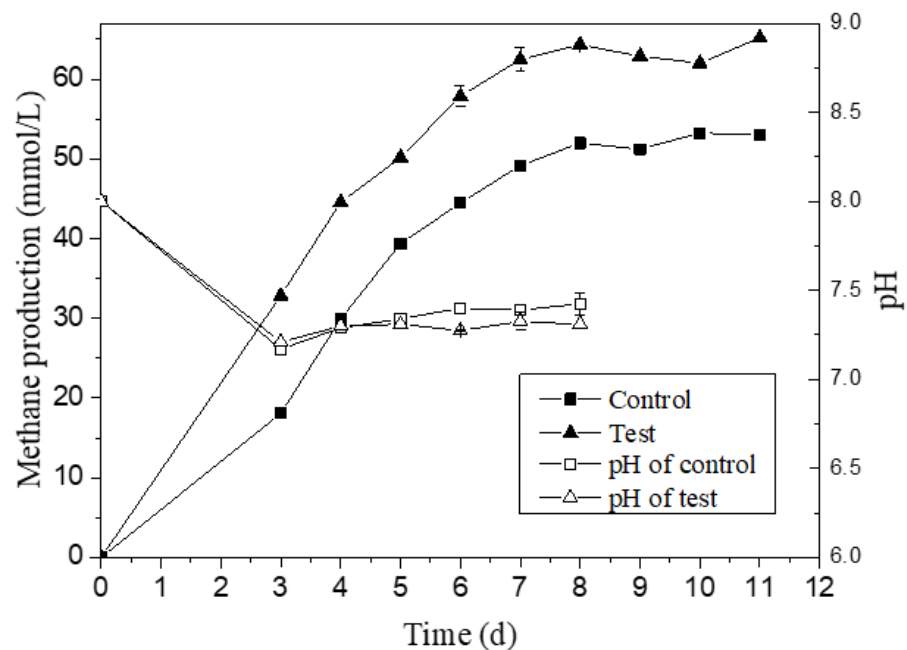


Groups	P (mM)	R _{max} (mM/h)	λ (h)	R ²
Control	25.50	2.93	4.15	0.98
FeBC-treated	33.73	37.10	5.84	0.99

Findings & Discussions



Findings & Discussions



Summary

- For the first stage, H₂ production from FW was notably promoted by 32.3% with FeBC treatment.
- For the second stage, FeBC significantly improved methane production by 22.8%
- FeBC released iron slowly during fermentation and affects microbial community and EPS composition

Next: Optimizing FeBC preparation process for improving its recyclability

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Thank you!



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