2.6 Micro-Oxygen Stimulation

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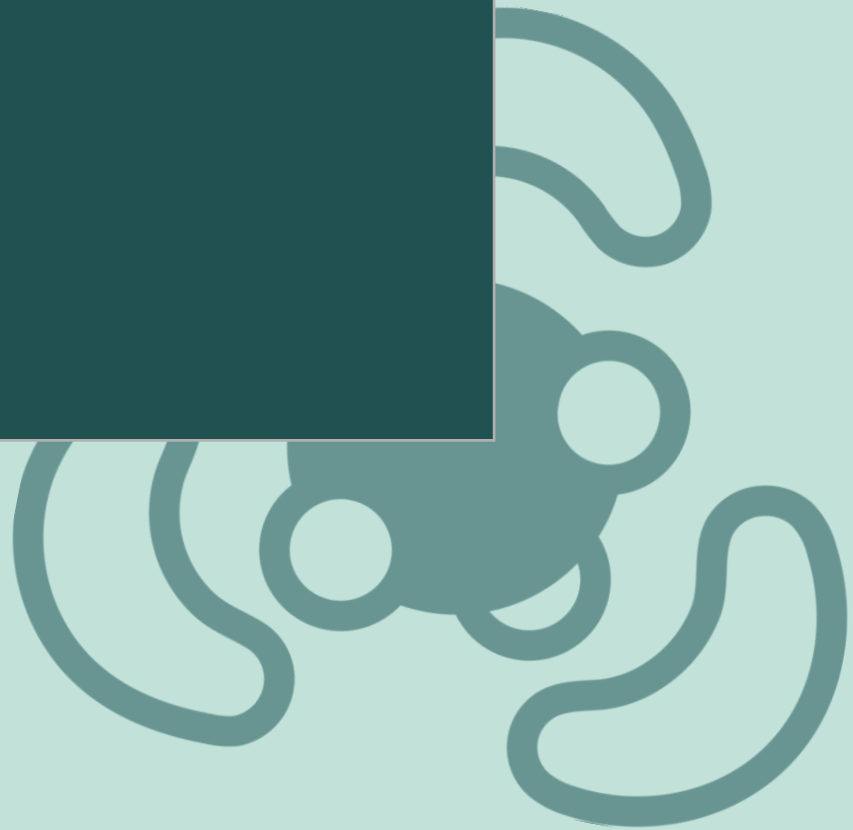

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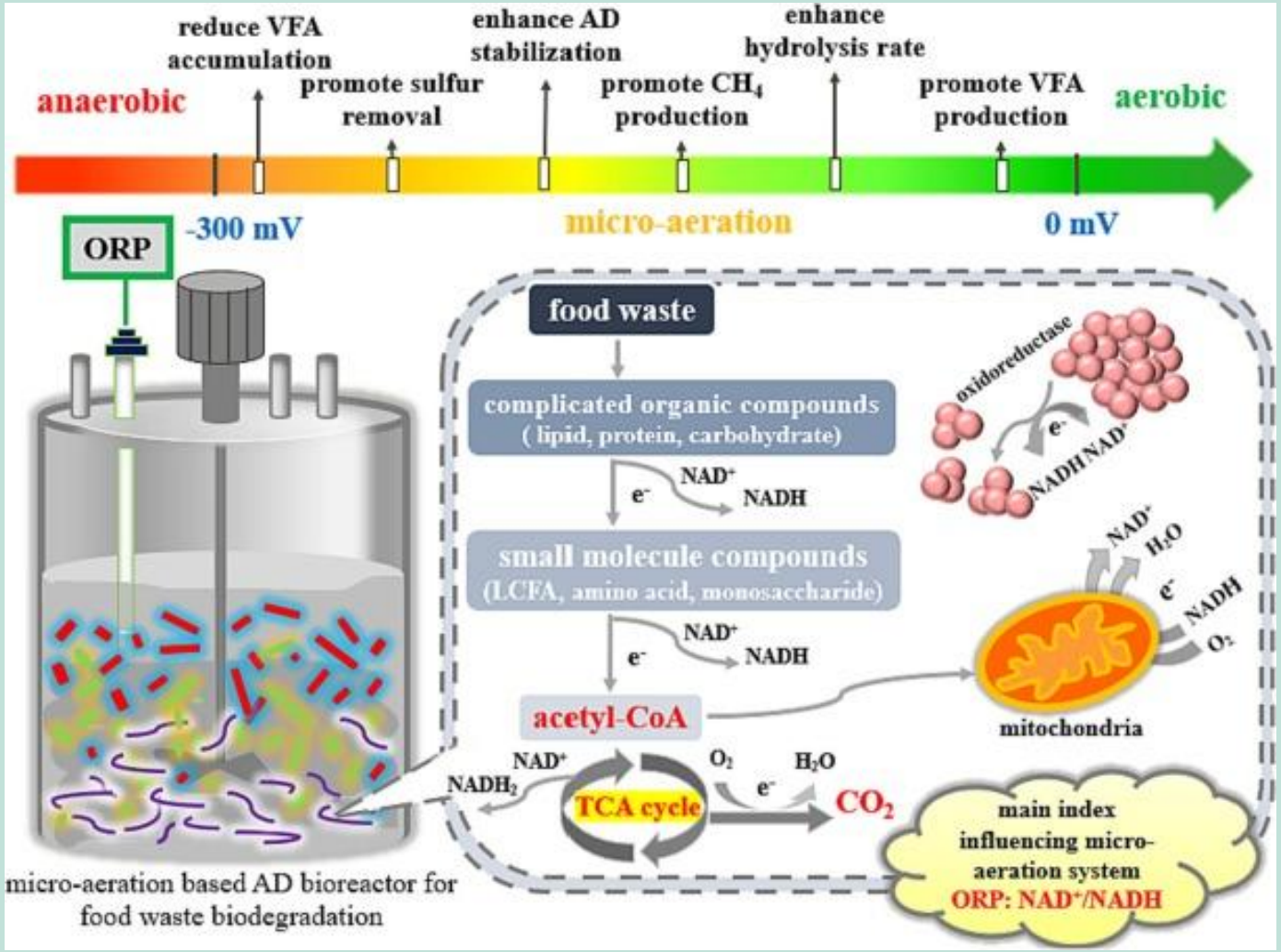
1 Microaerophilic Conditions (MC)



Spectrum of anaerobic to aerobic conditions [1]

Amount of oxygen in the system

→ Different Advantages in AD

→ Anaerobic to microaerophilic favourable

→ Aerobic higher VFAs, but better degradation of lignin

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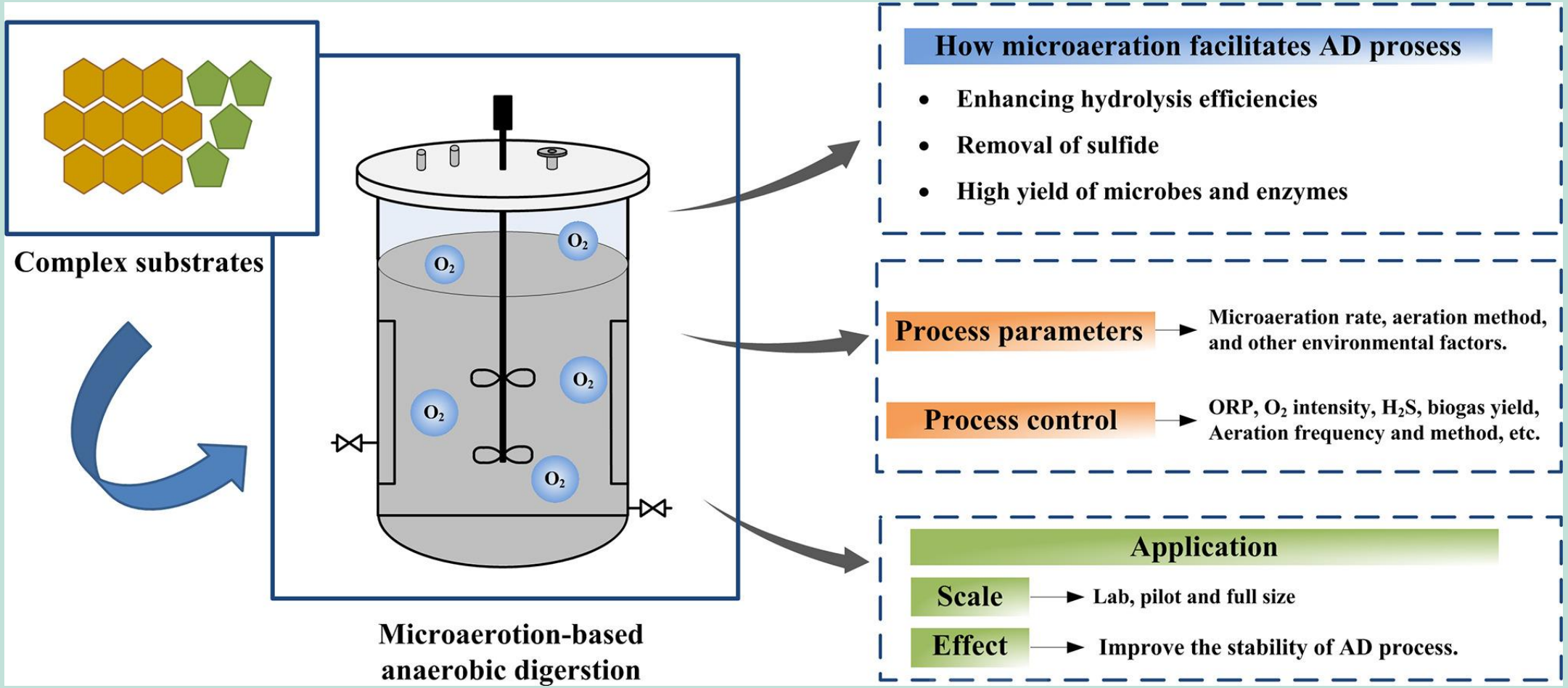
2 Implementation of MC



Implementation of a MC experiment [2]

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3 Monitoring Parameters

- Gas production (gas counter, Volume flow meter, mass flow meter)
- gas contents (Gas chromatography, infrared spectroscopy, Electrochemical sensors)
- pH - Acid and alkaline character
- Oxidation-Reduction Potential (ORP) - negative ORP, reducing power; positive ORP high, oxidising power
- Dissolved Oxygen (DO) – Amount of oxygen gas dissolved in water
- Total Solids (TS) – Solid particles in the sludge
- Chemical Oxygen Demand (COD) - Total of all oxidisable substances [3, 4]

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4 Performance Indicators

- Methane content (50-70 %)
- Gas production (0.3-0.8 Nl/gCOD)
- pH (6.8-7.4)
- Volatile fatty acids (especially propionic acid and butyric acid)
- FOS/TAC - Volatile organic acids/total inorganic carbon (below 1, optimal 0.3-0.4)
- COD Degradation
- C/N ratio (20-30)
- DO (0,5-1,2 mg/l)

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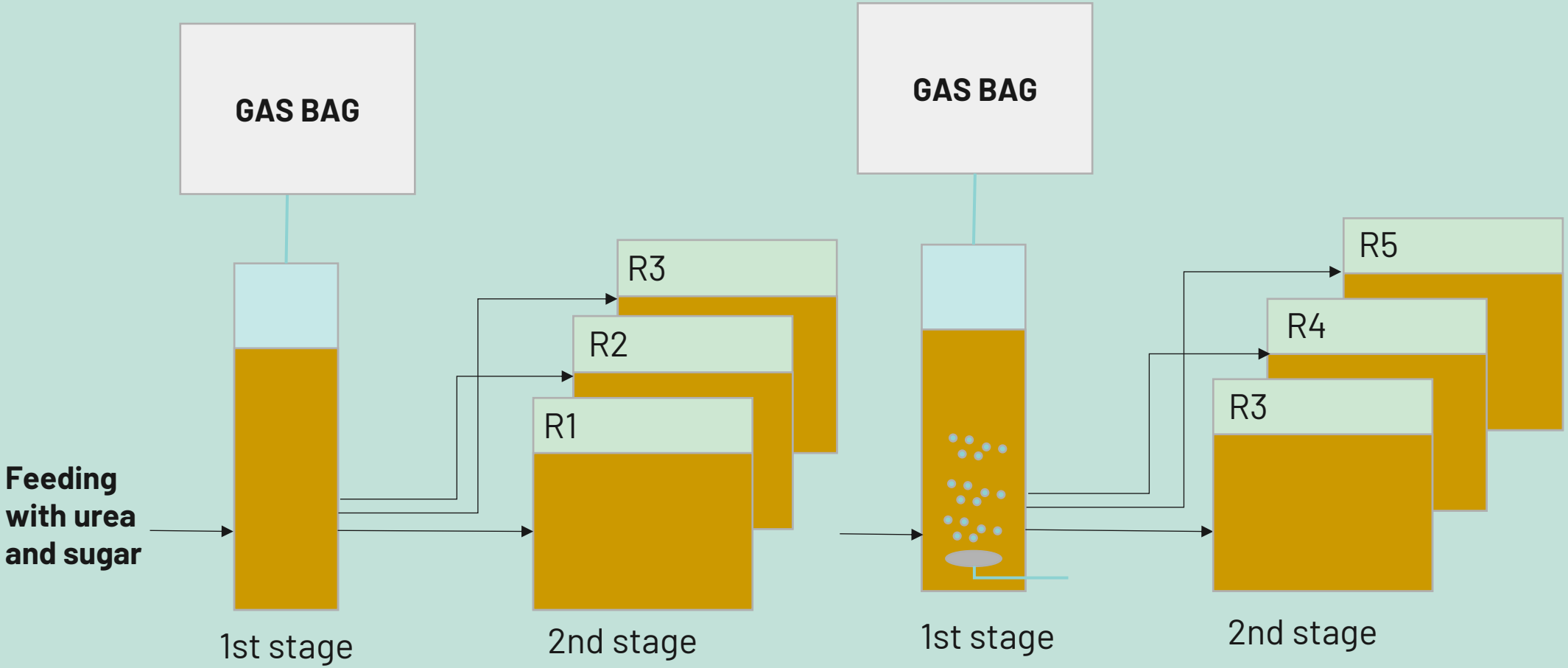
5 What happened in M4BG?



→ Two-stage AD experiment to avoid acidification

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6 Conclusion

Advantages

- Microaerophilic Conditions Diversify the MO
- Harsh conditions can create a more robust Microbiome
- Enhance degradation of NH_4 and Lignocellulose
- H_2S removal in gas phase

Disadvantages

- Difficult to implement
- O_2 impurities in the gas phase
- Removal of obligatory anaerobes

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References

[1] Micro-aeration based anaerobic digestion for food waste treatment: A review; Xiang Li https://doi.org/10.1016/j.jwpe.2024.104814

[2] Review on microaeration-based anaerobic digestion: State of the art, challenges, and prospectives; Qing Chen https://doi.org/10.1016/j.scitotenv.2019.136388

[3] A review of process parameters influence in solid-state anaerobic digestion: Focus on performance stability thresholds; Ajayi-Banji, A

DOI10.1016/j.rser.2022.112756

[4] Current progress in anaerobic digestion reactors and parameters optimization, Rocha-Meneses, L

DOI10.1007/s13399-021-02224-z

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