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# Efficient technology for food waste valorization: an integrated anaerobic digestion—microbial electrolysis cell for biomethane production

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## Abstract

Escalating food waste generation poses significant social and environmental risks, necessitating efficient waste management technologies. This study introduces an integrated reactor combining microbial electrolysis cell (MEC) pretreatment with anaerobic digestion (AD) to enhance biomethane production from food waste. Comprehensive analysis of food waste mechanisms, including volatile fatty acids, lipids, and carbohydrates, was conducted to assess organic matter utilization in the AD-MEC system. Significant improvements were observed in methane production, hydrogen recovery, and $CO_2$ conversion compared to traditional AD processes. The AD-MEC system demonstrated superior methane production (710 mL $CH_4$ $g^{-1}$ VS), exceptional hydrogen recovery (93%), and $CO_2$ conversion rates (91.98%), alongside enhanced removal rates of proteins, carbohydrates, and volatile fatty acids in soluble food waste, indicating improved organic matter utilization and increased methane production efficiency. The AD-MEC reactor offers a novel approach to food waste valorization, reducing waste sizes while generating bio-hydrogen for biomethane production. This research contributes to sustainable waste management practices and renewable energy production. 

## Author keywords

AD; BioMethane; Carbohydrates; Food waste; Hydrogen; MEC

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