NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
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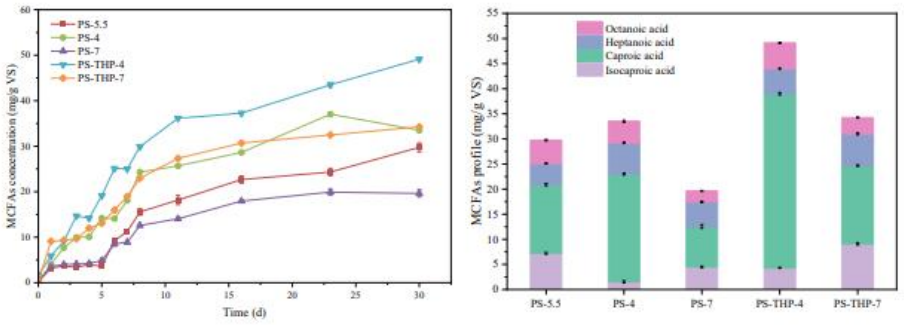
MINING HIGH-VALUE BIOPRODUCTS FROM SLUDGE: POTENTIAL FOR MCFAS PRODUCTION WITHOUT EXOGENOUS ELECTRON DONORS

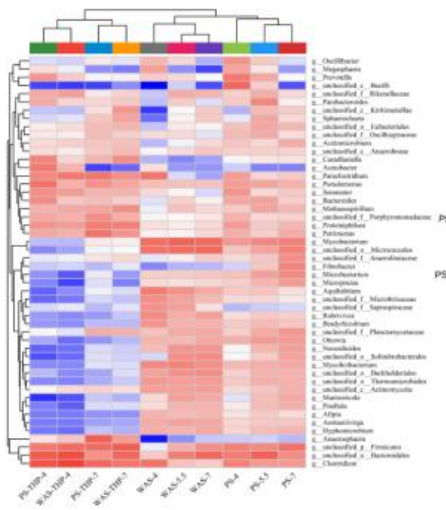
Abstract

The biological treatment is a commonly used technique in wastewater treatment plants (WWTPs); however, a large amount of sewage sludge produced is a serious problem. Production of medium-chain fatty acids (MCFAs) from sewage sludge is a promising method to realize resource recovery in a high-value dimension other than biogas or volatile fatty acids. In this study, MCFAs generation from different sewage sludge (primary sludge (PS) and waste activated sludge (WAS)) was investigated without additional electron donors (EDs).

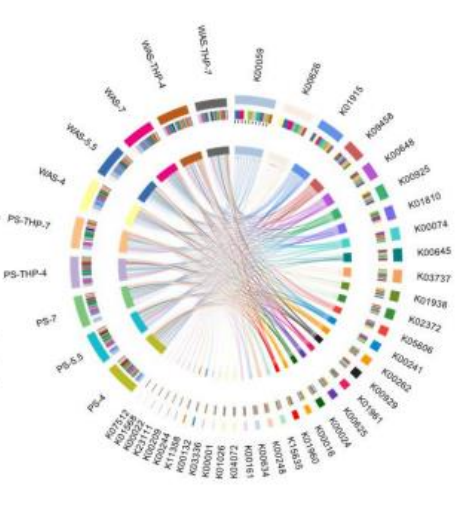
Primary sludge is a more suitable substrate than waste activated sludge for MCFAs production without the need for exogenous electron donors. Thermal hydrolysis pretreatment (THP) effectively decomposes fibers and generates reducing sugars, particularly under acidic conditions, enhancing substrate availability. pH regulation plays a critical role in directing ethanol fermentation and subsequent MCFA production pathways, and its combined application with THP can create a synergistic effect. Together, these strategies enable the development of a sustainable and self-sufficient MCFA production process, leveraging in-situ ethanol fermentation coupled with chain elongation for efficient resource recovery.



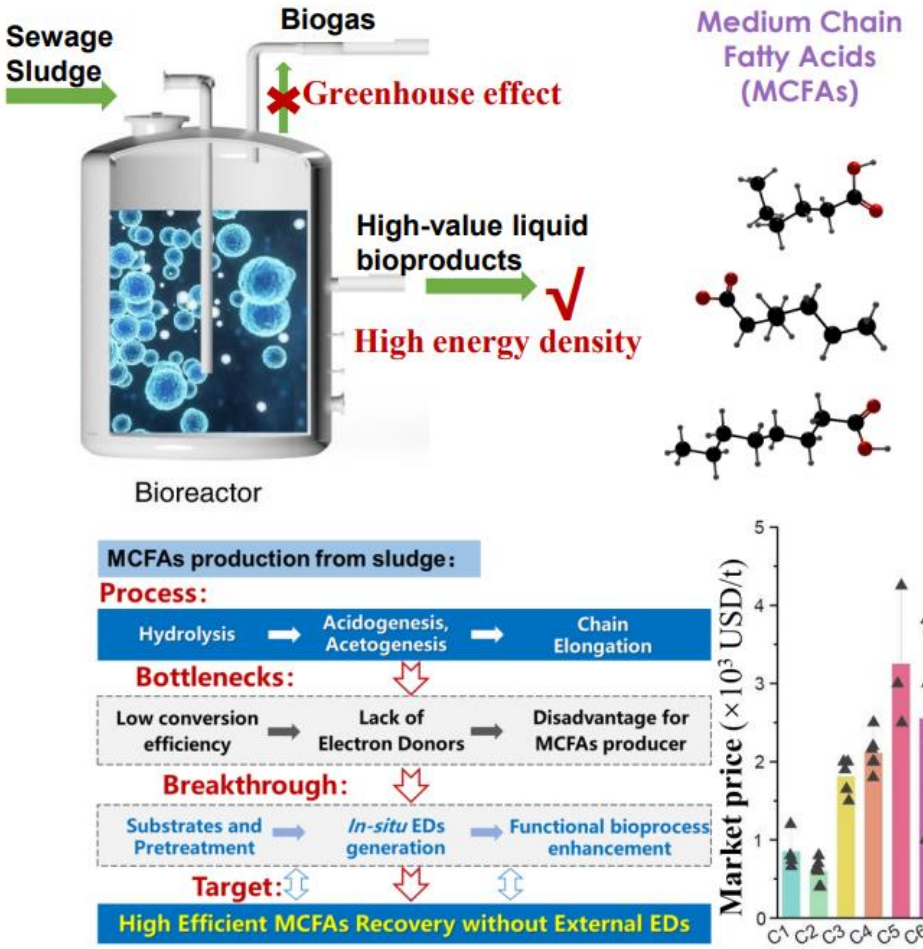
MCFAS Production and Profile



Effects of pH regulation and THP on microbial distribution



Effects of pH regulation and THP on metabolism pathway



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