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OPTIMISATION OF THE PRODUCTION OF BIO-BASED BASIC CHEMICALS FROM BIOGENIC SECONDARY WASTE THROUGH DISPERSION

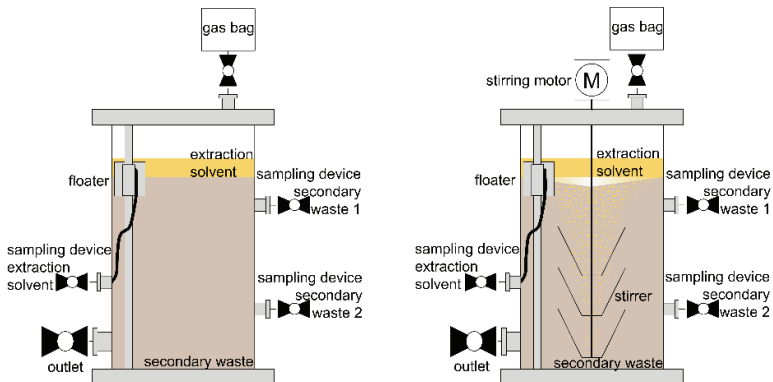
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Abstract – Biogenic waste from waste treatment plants, also known as secondary waste, can be used to produce bio-based carboxylic acids. Conventionally, these are produced by chemical synthesis of petroleum-based raw materials or synthesis of natural oils (e.g. coconut or palm kernel oil). Using organic residues and waste materials in a cascade to produce bio-based products can contribute to the circular bioeconomy. In the biological treatment process for production of bio-based carboxylic acids, microorganisms that are already present in the secondary waste use ethanol to convert short-chain carboxylic acids (with one to three carbon atoms) into medium-chain carboxylic acids (with four to ten carbon atoms). During the treatment process, medium-chain carboxylic acids are separated from the secondary waste by using in-situ extraction (liquid-liquid extraction). In previous studies, bioreactors without a dispersing function were used on a laboratory scale. In order to optimise the production and extraction of the formed medium-chain carboxylic acids, the bioreactors should be upgraded with a device for dispersing the extraction solvent in the secondary waste. Dispersing can increase the surface area between the extraction solvent and the secondary waste, and therefore, also the ability to extract the medium-chain carboxylic acids. To evaluate the effects of dispersing on the production of bio-based carboxylic acids, the production and extraction rates of static bioreactors without dispersing are compared with those of dynamic bioreactors with dispersing on a laboratory scale. Leachate from a composting plant was used as secondary waste. According to the results of the current study, it can be confirmed that dispersion has a positive effect on the biological treatment process. In addition to the increased degradation of the nutrient ethanol, the production of medium-chain carboxylic acids in the secondary waste as well as the extracted medium-chain carboxylic acids could be increased by dispersing.

Keywords – Bioeconomy; carboxylic acids; circular economy; composting plant; fermentative extraction; leachate; liquid-liquid extraction



Technical design of static bioreactor (left) and dynamic bioreactor (right).

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