

Progetto di Ricerca:

Anaerobic fermentation of cellulose-rich fraction of sewage sludge for the production of medium chain length carboxylic acids

Piano di Attività:

The medium chain length carboxylic acids (MCCs) production through anaerobic fermentation of the cellulose-rich fraction of sewage sludge (SS) (CRFSS) will be studied and optimized in microcosm and bench scale. The improvement of MCCs recovery will be assessed by adopting a bipolar membrane electrodialysis step (instead of current inorganic acid addition) which can allow coupling the obtainment of highly concentrated MCCs with the retrieval of Na⁺ added during the fermentation for its reuse.

CRFSS represents a potential source of simple sugars. The hydrolyzed CRFSS could be used for a bio-valorization, e.g., through the obtainment of medium chain length carboxylic acids (MCCs, containing 6 to 12 carbons). The production of MCCs from the CRFSS has never been reported, whereas it has been studied from secondary sewage sludge amended with ethanol or food-waste.

The feasibility of producing MCCs from different actual substrates will be studied at microcosm scale (0.1-1L), using CRFSS hydrolysate, spent yeast and glycerol. To this aim, different inoculum, and culture conditions (e.g., pH 7, 37°C and 150 rpm) will be tested. μ -GC and HPLC-rid/GC-fid will be used for monitoring biogas and carboxylic acids compositions, respectively. Also the co-fermentation of two or more substrates will be studied with another set of experiments. Then, kinetic studies will be performed using the substrates (and/or mixture of it) that resulted to produce MCCs (result of previous experiment). Such kinetic test, allowing to optimize the substrate concentration condition, will be carried out using the same microcosm scale and procedures previously described.