Synthesis of platform chemicals from sewage sludge by applying a hybrid thermochemical-biological approach Progetto "CROtonic acid from Sewage Sludge" LIFE21-ENV-IT-CROSS-LIFE" (Grant Agreement n. 101074164)

Research Project

Sludge produced in the EU by treatment of urban and industrial wastewater (WWTS) is 6 and 4 Mt/y on a dry basis. The organic matter contained in WWTS is enormous and the introduction of novel strategies that can valorise WWTS as feedstock for the synthesis of bio-based chemicals is a win-win approach in terms of circular economy and fossil resource exploitation.
The CROSS-LIFE project will play a novel role in the panorama of "WWTS-to-chemicals" projects by converting the organic content of in WWTS into a specific drop-in chemical (crotonic acid), without consuming new resources/feedstock, and simultaneously decreasing the volume of WWTS to be disposed. Crotonic acid, currently 100% fossil-based, finds application in coating, paint, textile, adhesives, ceramics, and agrochemical industries, with a global production of 60000 t/y and a selling price of 7-10 €/kg.
The technology involves the combination of thermochemical (e.g. hydrothermal carbonization) and biological microbial mixed culture (MMC) to produce a Polyhydroxyalkanoates-rich (PHA-rich) sludge, which is furtherly converted to crotonic acid by means of a novel thermolytic distillation procedure. As a whole the CROSS-LIFE project aim to design, test and operate two demonstration plants for conversion of WWTS into PHA-rich material, that will be converted within one of the demonstration sites.

Activity Plan

In the context of CROSS-LIFE project, the fellow's activity will include two major task:

1. Study of the conversion of VFA into PHA-rich sludge through MMC conversion: set-up and monitoring of a lab scale (10 gCOD/d) device to provide the information required for pilot plant engineering.
2. Contribution to the design, manufacturing and test of pilot scale system for thermolytic distillation of PHA-rich sludge and the obtainment of crotonic acid with adequate grade.