



SPIRE-09-2017

DEMETO

Full Title: Modular, scalable and high-performance depolymerization by microwave technology

Aim:

Nowadays, Polyethylene Terephthalate (PET)-based waste streams are mainly treated by means of mechanical processes, aimed at recovering plastic solid waste (PSW) for re-use; because of the degradation and heterogeneity of PSW, only single-polymer plastics can be processed, thus excluding all the more complex and contaminated waste. Quality is the main issue when dealing with mechanically recycled products, which, in the end, could just be burned or land field disposed.

Chemical processing could be considered, instead, for complete recovering of the molecules constituting the polymer (which would be then ready to be used to produce virgin PET) but, up until now, **de-polymerization approaches have not been widely adopted** within industrial practice due to their inability of working continuously, their very high reaction times and, in the end, inability to achieve economic return of investment.

The value chain of PET is quite complex, and involves several steps that already links in cross-sectorial interactions multiple companies across the European and worldwide market. It is at the end of that life cycle that **DEMETO proposes its innovative technology: the first feasible and sustainable (economically, environmentally and socially) industrial application of chemical treatment for reuse of PET plastics waste streams**. Thanks to a process intensifying approach based on innovative usage of microwave radiations, DEMETO's recycling technology will provide an indefinite life to PET, allowing to come back to its composing elements (Ethylene Glycol, EG, and Terephthalic Acid, PTA) without degrading the materials and, consequently, paving the way for a disruptive, large-scale circular economy for

plastic products.

Concept: DEMETO proposes a highly innovative approach to the Process Intensification of the alkaline hydrolysis chemical recycling reaction (de-polymerization) of PET plastic waste, based on the adoption of microwave radiations as energetic catalyser to reduce reaction time, reduce drastically the purification steps of PTA and increase productivity through a continuous process (instead of the batch ones typical of the industrial state-of-the-art). Already patented at international level and validated at different TRLs (from lab-scale conceptual testing up to full-scale design of a pre-industrial core reactor), the major strength of DEMETO's core concept is the adoption of a full process approach that, embedding at its heart the process intensifying MW-based reaction, then proposes a completely self-contained post-processing unit whose outputs, apart from the virgin-grade EG and PTA raw materials, will generate directly feedstock for the overall de-polymerization process. This overall concept is what guarantees the high flexibility and huge productivity-to-size ratios that the project will achieve at demonstration stage.

Start date: 01/09/2017

End date: 31/08/2020
