We MADE it! Towards tangible changes in the plastic industry

Plastics have seen a remarkable increase in use since the mid-20th century. However, there is mounting evidence that the leakage of plastics into the environment poses one of the great environmental challenges of the 21st century. Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options found that plastics production has increased 230-fold from 2 million tonnes (Mt) in 1950 to 460 Mt in 2019. The report concluded that despite recent policy initiatives to close the plastics loop, the plastics lifecycle is only 8% circular.

In 2019 plastic waste was more than doubled that in 200, but only 15% of plastic waste was collected for recycling and only 9% was actually recycled. Half of the plastic waste was landfilled and close to one-fifth was incinerated. A significant share (22%) of plastic waste was mismanaged (not disposed of adequately), ending up in uncontrolled dumpsites or burned in the open, leading to leakage into the environment.

If from one side we can work to better manage plastic waste, changing the way we are disposing of it, but also trying to emphasize the three R's- reduce, reuse, and recycle (Reducing, reusing and recycling waste helps save landfill space by keeping useful materials out, on the other side the amount of recycled material is very low, mainly because of a lack of proper recycling technology.

This is the reason we developed MADE, a Microwave Assisted Depolymerization: to help the existing polyester value chain recycle more, and in the case of mechanical recycling, even their own waste. Using microwave technology applied to alkaline hydrolysis, MADE is able to depolymerize polyesters into their building blocks, i.e. Terephthalic acid, TPA, and mono ethylen glycol, MEG.

The process can be

ENDLESS: every time we are depolymerizing PET we are erasing its history, so we can do it an infinite number of times without affecting the properties of TPA and MEG, with the same virgin-like PET quality

REAL ALTERNATIVE: Thanks to the depolymerization process, post-consumer PET waste can be seen as an alternative to fossil fuels, as it can generate building blocks for a new virgin PET.

ECO-FRIENDLY: Production of monomers becomes more sustainable compared with the one from crude oil, as the overall life-cycle release of CO_2 in the biosphere is reduced with respect to traditional processes.

CLOSED: The auxiliary chemicals needed for the reaction and for the subsequent work-up steps (i.e., NaOH and HCl) are recovered in situ using electrolysis.

After several depolymerization trials, trying to understand the advantages and limits of our process, we are now setting up the condition to provide PET chips for different applications: in other words, we are pushing textile to textile recycling, and due to the purity of our monomers, even textile to bottle.