Polyethylene (PE) and polyvinyl chloride (PVC) are among the most prevalent plastics used across various industries, yet they present unique recycling challenges that differentiate them from polyethylene terephthalate (PET). This presentation will focus on the chemical recycling of PE and PVC, providing an in-depth examination of current advancements and the complexities associated with these materials.

PE is ubiquitous in packaging, construction, and consumer goods due to its versatility and low cost. However, its wide range of forms and the presence of additives complicate recycling. Chemical recycling methods such as pyrolysis, which breaks down PE into hydrocarbons, and depolymerization, which aims to return PE to its monomers, offer promising solutions to these challenges by enabling the regeneration of high-quality PE and addressing issues related to contamination and degradation. Several catalysts will be reviewed that promise to reduce the operational and capital costs associated with recycling PE. Among others we will review beta-zeolite, sodium on alumina and tungsten, focusing on abundant and affordable solutions.

Across Europe around 30% of PVC waste is currently mechanically recycled. It poses distinct challenges due to its chlorine content and diverse additives, which can produce hazardous by-products during recycling. Chemical recycling of PVC involves processes such as dechlorination followed by either pyrolysis or solvolysis. Dechlorination is crucial to remove chlorine, mitigating environmental and health risks. Subsequent methods, like pyrolysis, break down PVC into valuable chemicals, while solvolysis utilizes solvents to decompose PVC into monomers or other useful products. For example, Vinyloop™'s dissolution technology recycles complex PVC waste, including legacy additives. Focused on textile fibers, DISSOLV aims to drive the recycling of PVC waste from flooring, carpets and tarpaulin. On the other hand AC Biode is developing new methods to completely recycle PVC from automotive cables using hydrolysis.

The presentation will contrast the recycling challenges and methodologies for PE and PVC with those for PET. While PET recycling benefits from well-established chemical processes like hydrolysis and glycolysis, PE and PVC require more specialized approaches due to their chemical compositions and the presence of problematic additives. We will look at other examples such as Arcus Greencycling, Quantafuel, Plastic Energy. Emerging innovations, including novel catalysts and optimized reaction conditions, will also be discussed, showcasing their potential to improve the efficiency and feasibility of chemical recycling for PE and PVC.

Attendees will gain valuable insights into the state-of-the-art chemical recycling technologies for PE and PVC, their distinctive challenges, and how these methods can contribute to more sustainable plastic waste management and a circular economy.