

## Chemical Recycling

A-108

### ***Pyrolysis of PC/ABS-Blends in a gaseous ammonia atmosphere***

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Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) blends are widely used in sectors such as electronics and automotive because of their excellent impact strength and thermal resistance. However, mechanical recycling of these materials is difficult, as it often causes thermal degradation and a resulting loss of key properties. Chemical recycling, especially pyrolysis, represents a promising alternative. In this process, PC/ABS is thermally decomposed in the absence of oxygen, producing valuable monomers or structurally related compounds such as bisphenol A (BPA) or phenol. The pyrolysis behavior of condensation polymers like PC differs from that of addition polymers such as polyolefins, because bond cleavage occurs specifically at functional groups rather than randomly along the polymer backbone. These functional groups also serve as reactive sites for reagents introduced into the gas phase.

In this study, we investigated the effect of ammonia addition on PC pyrolysis as a gaseous reagent by varying its concentration at constant temperature and by varying the temperature at constant ammonia concentration. The experiments were conducted on the gram scale in a laboratory fixed-bed reactor, where the meltable polymer was placed in a crucible and exposed to a reactive gas flow from top to bottom. The pyrolysis products were transferred from the reactor to a condensation system within seconds, and the non-condensable gases were analyzed using at-line gas chromatography. The condensates were subsequently characterized in detail by GC-FID and comprehensive two-dimensional gas chromatography-mass spectrometry (GCxGC-MS).

The results show that the formation of a coked residue, which usually occurs during the pyrolysis of PC, can be almost completely suppressed. At the same time, the yield of the liquid products and the desired target species can be significantly increased. In the presentation, the results including detailed analyses will be disclosed. Furthermore, a hypothesis about the reactions that take place will be presented.