Gaschromatographic Analysis of Process-Induced Changes during Mechanical Recycling of PP and PS Waste Streams

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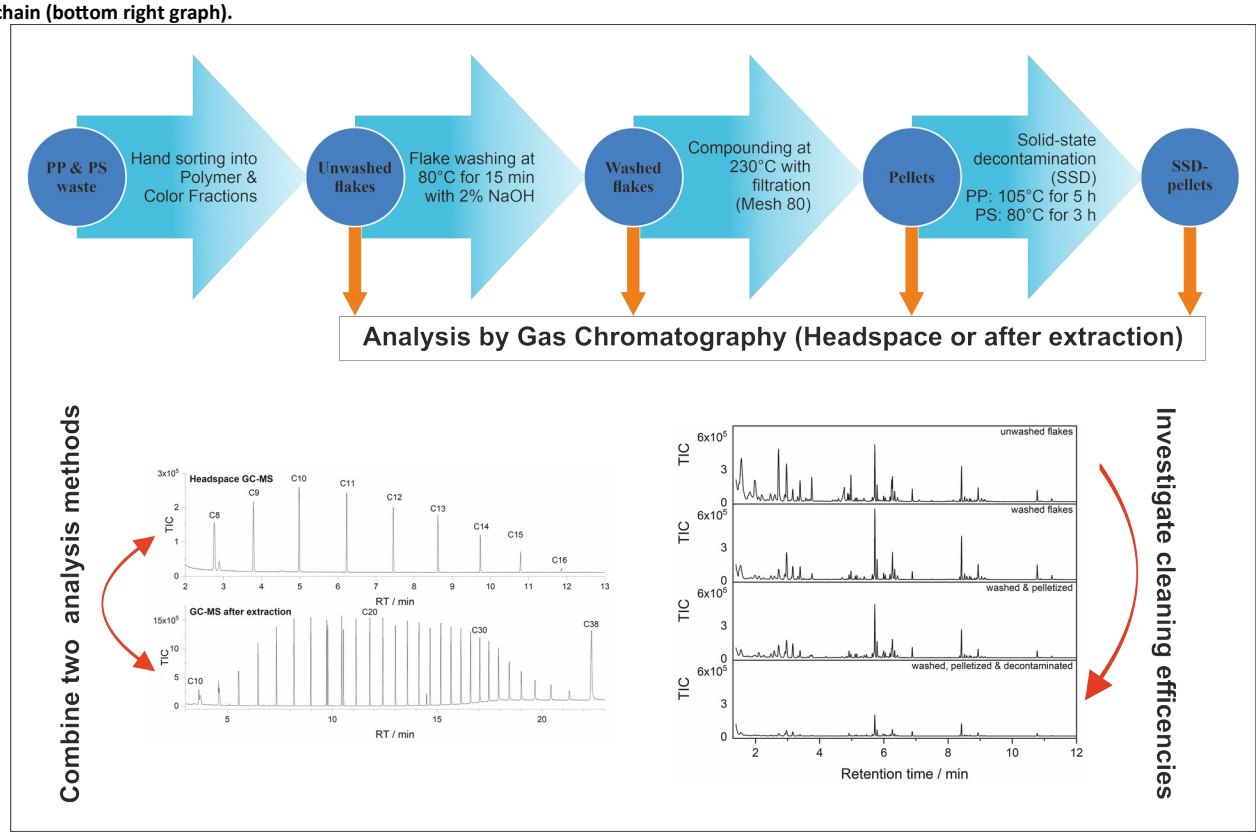
The uncertain origin of post-consumer plastics waste often contributes to the difficulty of effective recycling, particularly in the case of food-contact materials (FCM). Given the extensive range of potential applications, the number and concentration of possible contaminations is similarly vast. For this study, FCM waste was hand sorted, initially according to polymer type (PP and PS) and subsequently according to color fraction. The sorted waste was reprocessed along the mechanical recycling path: washing, compounding, and solid-state decontamination. Changes in the analyte profile were monitored during each step by two separate methods for gas chromatography coupled to mass spectrometric detection. Three important conclusions were drawn from the results. First, the morphological differences between PP and PS resulted in very different cleaning efficiencies for each of the individual processing steps. Second, the previous fields of application had a massive influence on the observed levels of contamination for each of the color fractions and thus also affecting the cleaning process. Third, the presence of fillers, such as colorants, also visibly affected both contamination levels and cleaning efficiencies of the individual steps.

Figure 1: Investigated process chain (top graph), Comparision of analytical methods (bottom left) and observed cleaning trends along process chain (bottom right graph).



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