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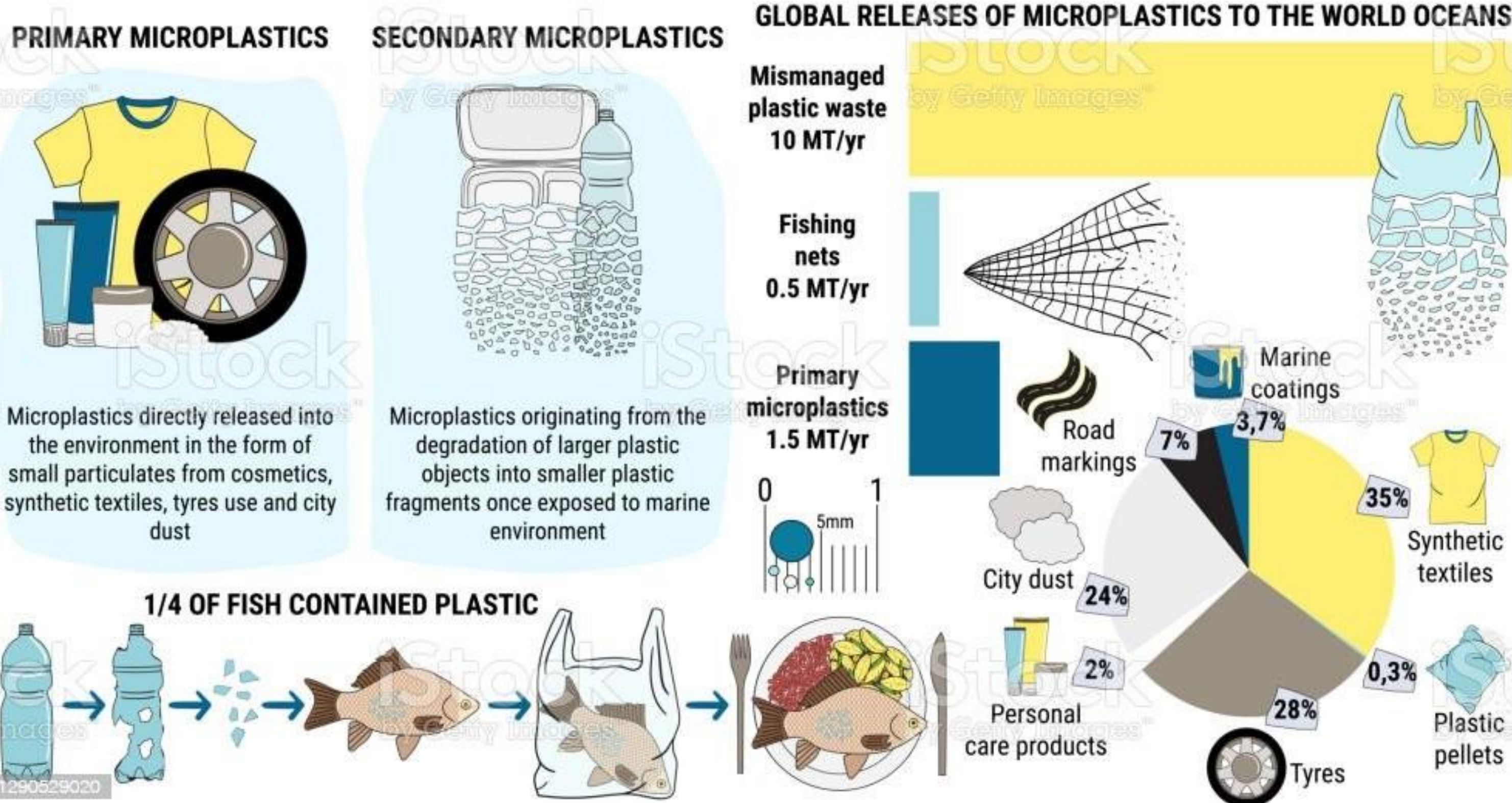
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Introduction

The present work is focused on **assessing the validity of ATR-FTIR spectroscopy** towards identification of microplastics in source-separated food biowaste. Since biowaste is treated towards compost, which is used as a soil amendment or organic fertilizer there is a need to identify both qualitatively and quantitatively microplastics in this waste stream and to set the pertinent compost specifications in terms of microplastics content.

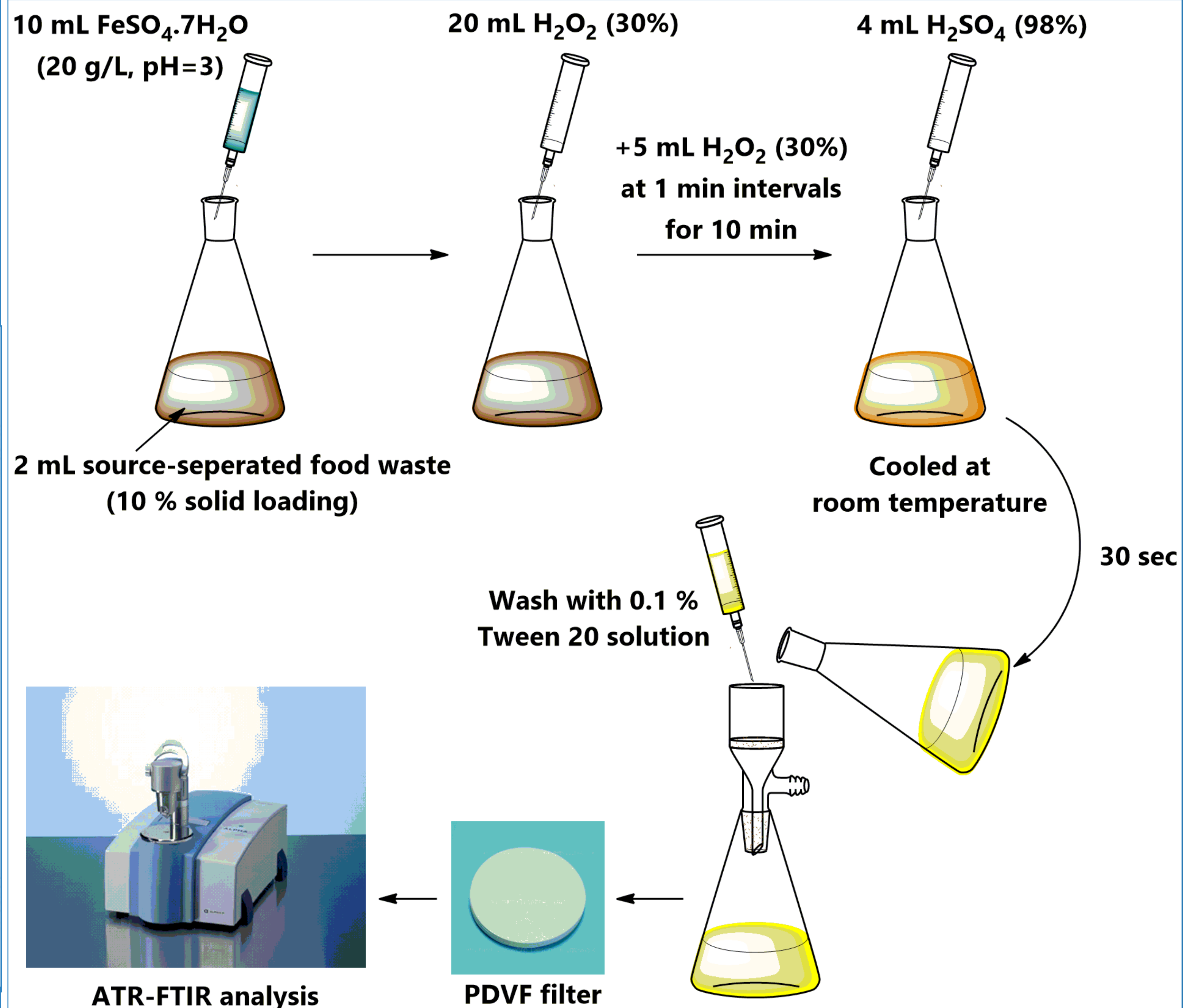
MICROPLASTICS



Indicative sources of global releases of microplastics

Methodology

Chemical digestion of organic matter (Fenton process)



Results and Discussion

Pure polymeric materials (PLA, PBS, PET, LDPE, HDPE, and PA) in the form of films or flakes were examined to collect spectra, recognizing different characteristic wavenumber peaks per polymer type (**Figure 1**). A variety of mixtures was also prepared and characterized through ATR-FTIR spectroscopy aiming to identify the characteristic peaks per polymer type in each mixture (**Figure 2**). As observed, it was possible to distinguish different polymers when mixed, even different polyesters.

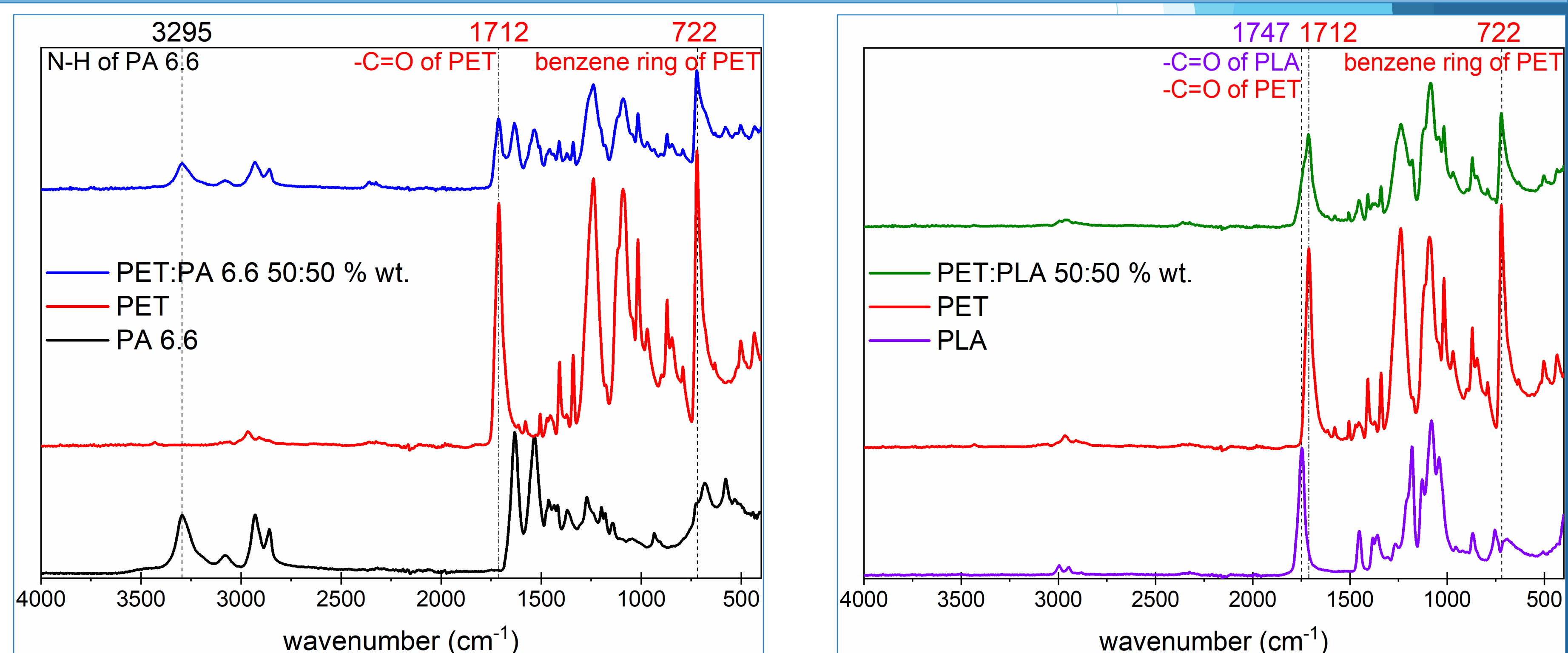


Figure 2. Indicative ATR-FTIR spectra of mixtures of **a)** PET and PA 6.6 flakes and **b)** PET and PLA flakes

Dried food waste with known composition was subjected to chemical digestion in order to remove the organic load. After determining also the ash contained, the mass balance revealed a 4% w/w estimated to be polymeric materials. The residue of chemical digestion (**Figure 4 b**), in which the plastic fraction is contained, is further measured *via* ATR-FTIR, in order to identify the polymers in the plastic fraction (**Figure 3**).

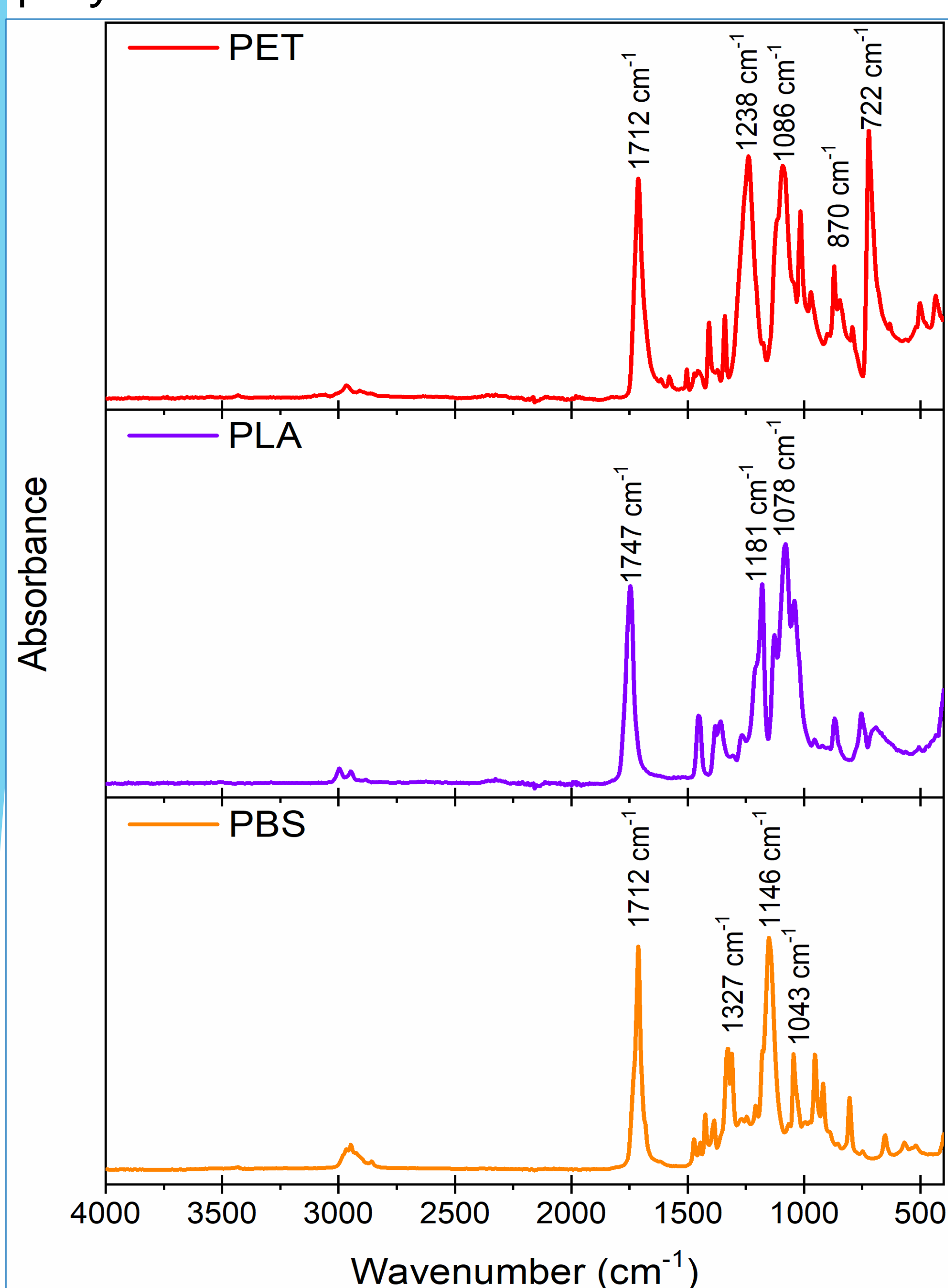


Figure 1. ATR-FTIR spectra of three common polyesters (PET, PLA, PBS) in the form of flakes

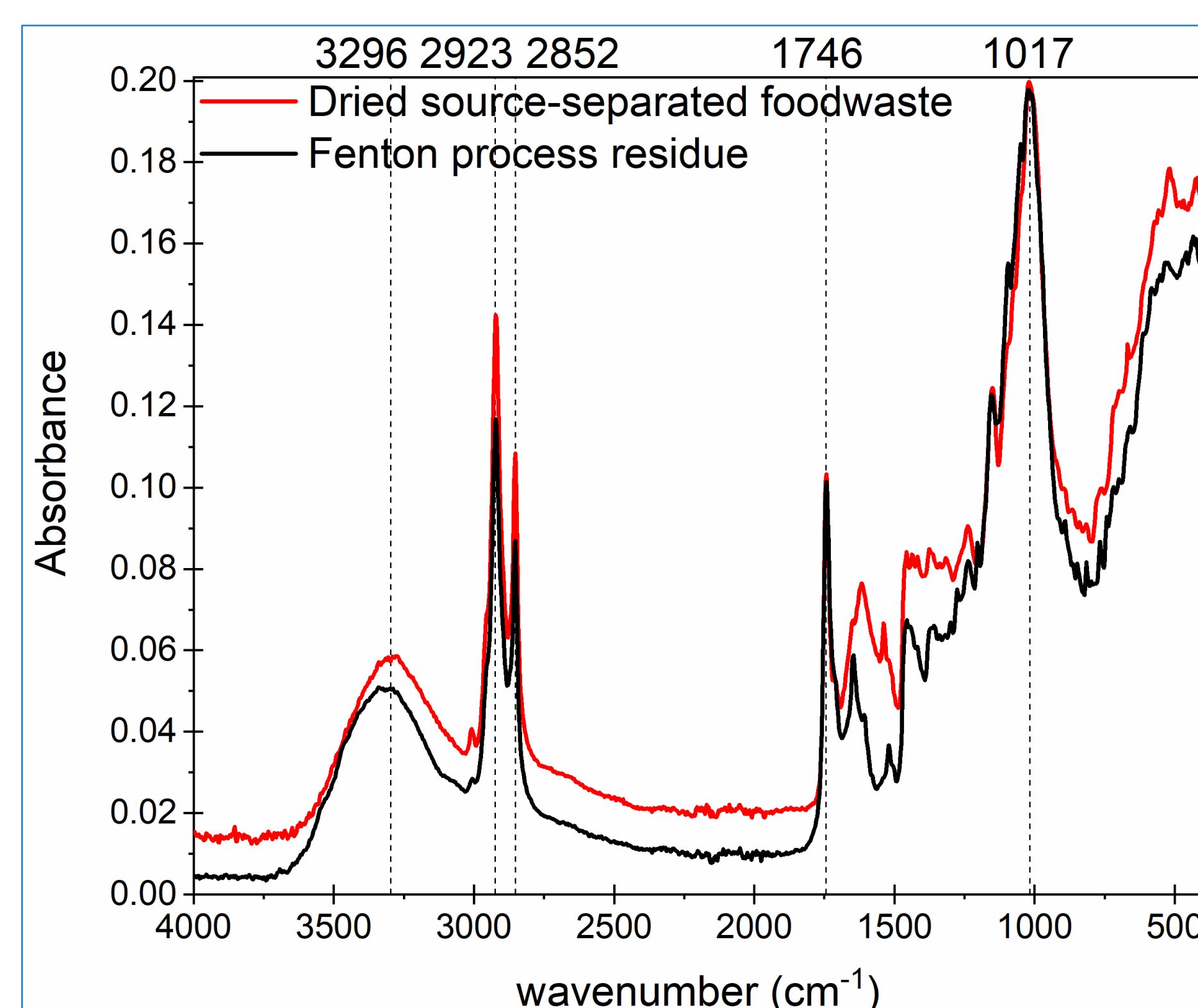


Figure 3. Comparative ATR-FTIR spectra before and after the Fenton process



Figure 4. **a)** Source-separated foodwaste and **b)** Fenton process residue

Acknowledgments

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References

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