



## **BIONTOP\_PLA-based material identification**

Authors: Sara Sánchez-Esteva<sup>1</sup>, Cristina Fernandez-Avila<sup>2</sup>, Laura Rodriguez-Turienzo<sup>2</sup>

*Affiliation: Iris Technology Solutions, Carretera d'Esplugues, Local 39-41 08940 Cornellà de Llobregat, Spain*

*Telephone: +34 935570119, ssanchez@iris-eng.com*

Keywords: PLA (Polylactic acid), material identification, NIR spectroscopy, hyperspectral imaging

### **Introduction**

Material sorting from mixed plastic waste can be a challenging process based on different steps such as manual screening, shredding, cleaning, wind sifting and material identification. The identification of different plastic materials and polymer types has been successfully achieved through the use of NIR (near infrared) spectroscopic techniques such as hyperspectral image analysis (Moroni and Mei, 2020). The addition of new developed bioplastics to the traditional plastic waste stream during last years, have created a need to sort these biomaterials in order to also recycle them. The quality of the spectral signal depends principally on the characteristics of the analyzed material (e.g., thickness, transparency) and the instrumentation set up used. Nevertheless, each polymer (either bio-based or petroleum-based) presents specific features that can be used to define the identification procedure.

In this study, NIR technology together with chemometric approaches have been used to identified a bio-based plastic (PLA-based) from other standard plastic wastes, with the objective of discriminate the novel developed BIONTOP materials.

### **Experimental**

PLA-based materials developed in different work packages within BIONTOP project were supplied from the consortium to IRIS (figure 1). Two main demonstrators for food packaging were evaluated; tray and film format. To meet the requirements of all materials under study, two different technologies were studied and tested; i) near infrared spectroscopy (NIR) and ii) hyper spectral imaging (HSI) combined with digital image processing and chemometric analysis of the obtained spectra established for each system independently.

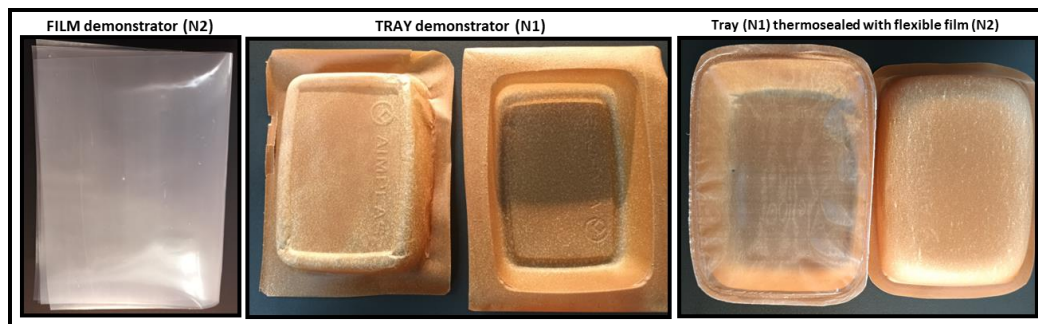


Figure 1. BIONTOP demonstrators for food packing application.

### Results and Discussion

Characteristic PLA spectral signatures were observed in both final BIONTOP demonstrators (Figure 1, top). For the tray formulation, new features were observed related to the agricultural filler addition (figure 1, bottom).

Finally, classification models were developed to discriminate PLA-based tray and film demonstrators from other standard petroleum-based polymers (PP and PE). The developed models were validated with success, where results showed 100% correct predictions for all the tested materials.

### Conclusions

BIONTOP demonstrators developed in different WPs were analyzed and spectrally characterized. Significant spectral differences in PLA materials compared to other petroleum-based polymers were identified. Additionally, common characteristic PLA spectral signatures were observed in all final demonstrators for films and trays.

Promising prediction results for the identification of PLA-based BIONTOP materials were obtained for both, NIR and HSI technology for films and tray formats. Thus, the new bio-based material sorting could then be handled through their respective adequate recycling stream in a recycling process.

### Acknowledgments

The BIONTOP project (Novel packaging films and textiles with tailored end of life and performance based on bio-based copolymers and coatings) has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 837761.

### Biography

Sara Sánchez Esteva has completed her PhD in applied spectroscopy and soil science at Aarhus University, Denmark. She has over 5 years of experience in applied spectroscopy and chemometrics in a diverse range of applications including the characterization of plastic waste materials. Currently, she is part of the chemometrics team at Iris Technology Solutions which is



## **2<sup>nd</sup> Conference on Green Chemistry and Sustainable Coatings**

greenchemco

*Pisa, Italy, 28<sup>th</sup>-30<sup>th</sup> June 2023*

leading European company in the manufacture of photonic and artificial intelligence solutions for the control of industrial and production processes in real time.