ISGC 2022

N°1136 / PC
TOPIC(s) : Polymers or composites / Life cycle assessment, biodegradability, eco-toxicity

FATTY ACID STARCH ESTERS (FASES) AS PLASTICIZING AND HYDROPHOBIC ADDITIVES FOR PLA FILAMENTS? IMPACT OF FASES ON PROPERTIES AND BIODEGRADABILITY

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PURPOSE OF THE ABSTRACT

The textile industry is considered as one of the most polluting of our century. As a result, textile market is increasingly interested in the development of bio-based materials to replace materials from petrochemicals. Polylactic acid, PLA, is one of these alternatives, but main products have a low life expectance because of PLA degradation due to esters hydrolysis.(1) As another bio-based polymers, starch esters are now well known as potential important thermoplastic polymers, with excellent filmogenic characteristics. Moreover, Fatty Acid Starch Esters (FASEs, fatty acid chains grafted onto Starch backbone) are well known as a class of hydrophobic material. The FASEs degree of substitution and fatty chain length can be modulated according to synthetic conditions.(2)

This study deals with the development of multifilaments based on PLA blended with different kinds and contents of FASEs obtained by melt spinning process. The aim of this bio-based blend is to enhance water resistance and processability of neat PLA by improving its hydrophobicity while preserving acceptable melted-state rheological properties for melt spinning process. Two different FASEs (fatty chain length: C12 and C18) are introduced in PLA by twin screw extruder at several contents (figure 1). Impact of FASEs on PLA rheological, mechanical and hydrophobic properties were evaluated on pellets, films and multifilaments, as well as ageing in accelerated conditions. The influence of FASE and FASE content on the increase in blends hydrophobicity will be discussed, as well as mechanical behavior of materials.

FIGURES

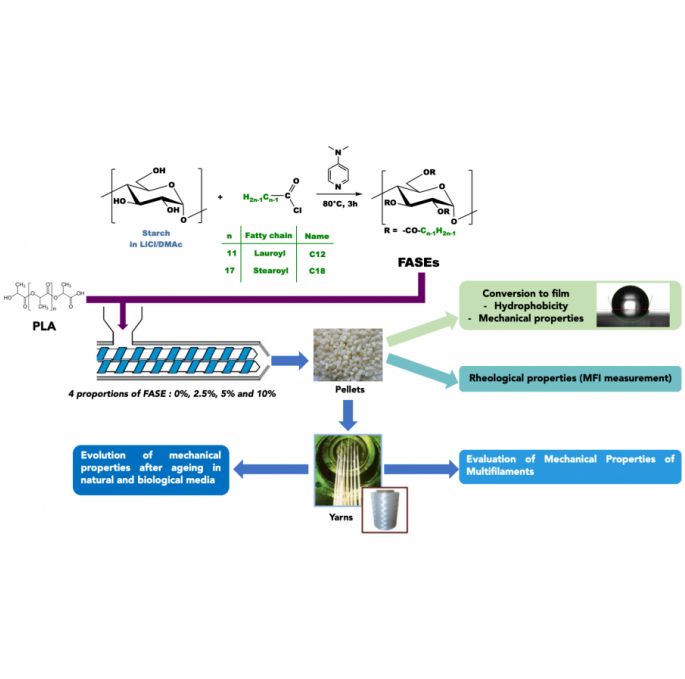

FIGURE 1

Figure 1

Use of FASEs as PLA additive – From polymers to materials and their properties.

FIGURE 2

KEYWORDS

PLA | Fatty Acid Starch Esters | Hydrophobicity | ageing of material

BIBLIOGRAPHY

[1] Barral, V.; Dropsit, S.; Cayla, A.; Campagne, C.; Devaux, É. Polymers, 13, 171, 2021.

[2] Vanmarcke, A.; Leroy, L.; Stoclet, G.; Duchatel-Crépy, L.; Lefebvre, J.-M.; Joly, N.; Gaucher, V. Carbohydrate Polymers, 164, 249-257, 2017.