EFFECTS OF RESIDUES ON THE DEGRADATION OF PHA PRODUCED FROM MIXED MICROBIAL CULTURES AND PROCESSED IN EXTRUSION

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Thermal degradation upon melting is one of the major drawbacks reported for polyhydroxyalkanoates (PHA). However, the role of residues originating from the fermentation and the extraction steps on the thermal stability of this class of biopolymers still needs to be clarified. In the particular case of PHA produced from mixed microbial cultures (MMC), this topic is even less documented in the literature. Here, two polyhydroxy(butyrate-co-valerate) (PHBV) produced from MMC enriched in PHA accumulating organisms and fed with cheese whey were studied. A micro extrusion line is used to produce filaments and assess the processability and the degradation of processed PHBV. The prototype micro extrusion line allows for studying grams of materials. The two PHBV contain 18 mol% HV. PHBV was recovered with 11 wt% residues, and further submitted to a purification procedure resulting in a second biopolyester containing less than 2 wt% impurities. The thermorheological characterization of the two PHBV is first presented, together with their semicrystalline properties. Then the processing windows of the two biopolyesters are presented. Finally, the properties of extruded filaments are reported and the thermomechanical degradation of PHBV is extensively studied. The structure was assessed by wide angle X-ray diffraction, mechanical and rheological properties are reported, thermal properties are studied with differential scanning calorimetry and thermogravimetric analysis, whereas Fourier Transform Infrared spectroscopy was used to assess the impact of the extrusion on PHBV chemical structure. All results obtained with the two PHBV are compared to assess the effects of residues on both PHBV processability and degradation.

- Topic: ___ Biopolymer processing technologies and polymer stability