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Poster no 15

Experimental platform for evaluation of the influence of substrate crystallinity on enzymatic degradation of poly(ethylene terephthalate) (PET)

Thore B. Thomsen, Tobias Radmer, Cameron J. Hunt, Anne S. Meyer

Accumulation of plastics in the environment poses a global environmental threat. Poly(ethylene terephthalate) (PET) is one of the major plastic types, and accounts for 10.2% of the total plastic production [1]. Enzymatic recycling of plastics, such as PET, is a promising technology for a more sustainable use of plastics. However, numerous studies have shown that the activity of PET degrading enzymes is limited on the crystalline regions of PET [2-4]. A pretreatment step is therefore required for efficient enzymatic degradation of PET [3].

Here, we present a new experimental platform for evaluating the influence of the X_c on the enzymatic degradation of PET. We modify the crystallinity of amorphous PET disks in a controlled manner via thermal annealing [2]. The effect of the substrate X_c on the enzyme activity was then evaluated using a novel, compartmentalized UV absorbance assay. This assay enables continuous detection of soluble hydrolysis products released during enzymatic degradation of PET [5]. We show that initial enzymatic treatment (denoted as the lag phase) of PET material does not result in any product formation. The duration of this lag phase, and the steady-state product formation rate did both decreased with increasing X_c .

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