

LESS IS MORE: HYDROLYSIS OF POLYESTERS IS ENHANCED BY A TRUNCATED ESTERASE

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Polymers frequently used for one-way applications like packaging are preferably biodegradable, albeit non-biodegradable polyesters are mostly used. Biodegradability of the aliphatic/aromatic copolyester poly(butylene adipate-co-terephthalate) (PBAT) has been investigated, showing biological decomposability under composting conditions. However, little is known about its anaerobic hydrolysis while large amounts of food packaging ends up in biogas plants. The enzyme EstA from *Clostridium botulinum* (Cbotu_EstA) actively hydrolyzed PBAT while it failed to act on polyethylene terephthalate (PET). Yet, enzymes would allow mild decomposition of widely used PET enabling recycling of the monomeric building blocks. The enhancement of the hydrolase activity with regard to polyester hydrolysis can be achieved by fusion of hydrophobic domains, improving the biocatalyst adsorption on the hydrophobic polymer surface, or by substitution of specific residues, enlarging the active site of the enzyme. The deletion of the Cbotu_EstA N-terminal domain can satisfactorily combine both approaches. Surface engineering successfully produced a highly active Cbotu_EstA variant which was able to hydrolyze PET. Truncation of the N-terminal domain of Cbotu_EstA improved the adsorption of the enzyme on hydrophobic polyester surfaces and enhanced their hydrolysis eight times more compared to the wild-type enzyme, based on released monomers quantification.

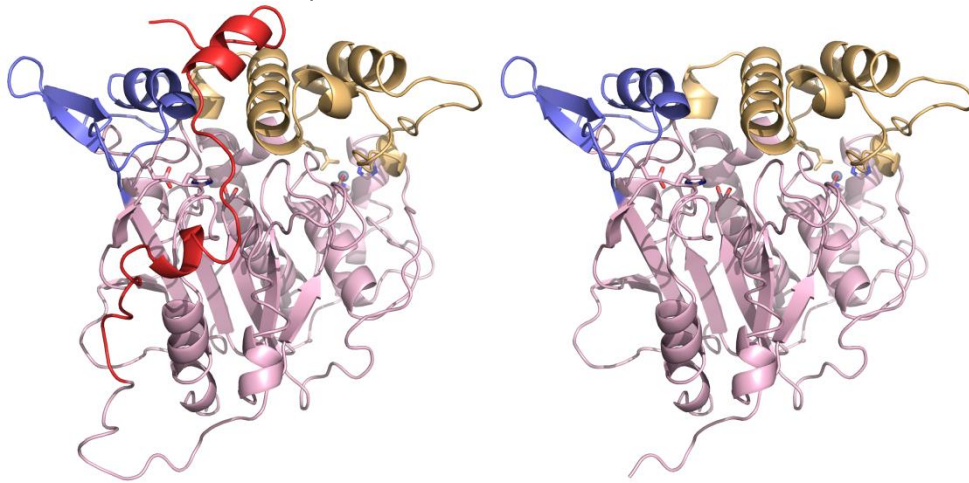


Figure 1. Comparison of overall structures of Cbotu_EstA (left) and del71Cbotu_EstA which misses the N-terminal domain (red)