Screening Biocatalysts for Targeted Polyester Degradation

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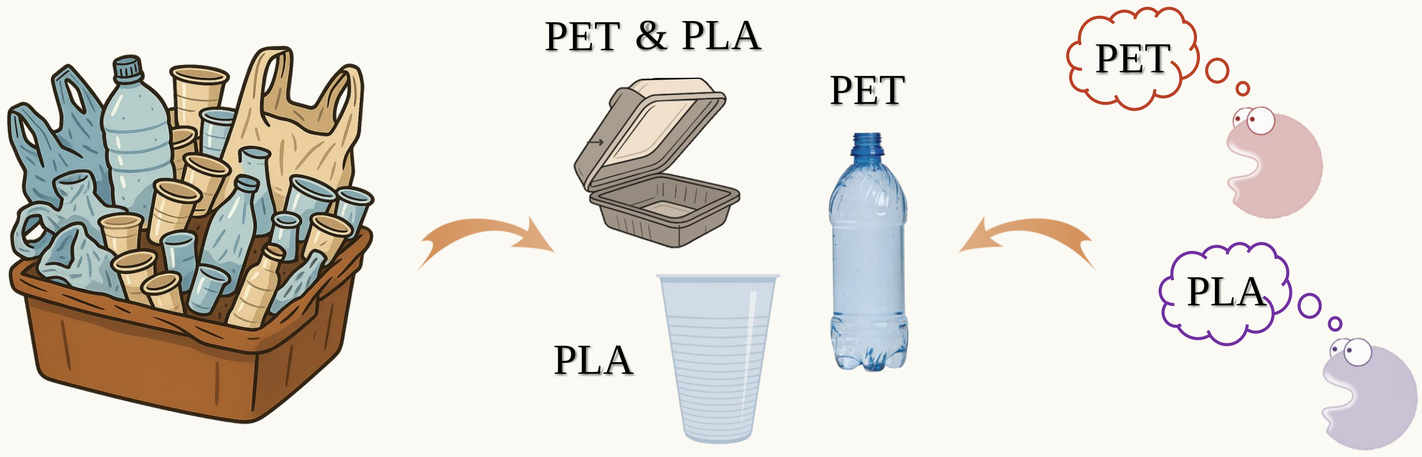
The challenge of managing complex packaging waste streams

Packaging materials, mostly utilized in food-related applications, contribute significantly to pollution.

Mixed-polymer packaging poses a challenge for **mechanical recycling** due to its poor material properties.

Incineration and **chemical recycling** offer partial solutions, as they conflict with circular economy goals or lack efficiency for similar-type polymer mixtures.



Enzymatic recycling offers a promising alternative, through selective breakdown of polymers like PLA and PET, addressing challenges associated with complex packaging waste streams.

Experimental procedure

17 serine hydrolases
(proteases & esterases)

In-house
Heterologous expression (*P. pastoris* & *E.coli*)

Commercial
Dissolvement in optimal buffers

Plastics of aim

PLA
Semi-crystalline PLLA

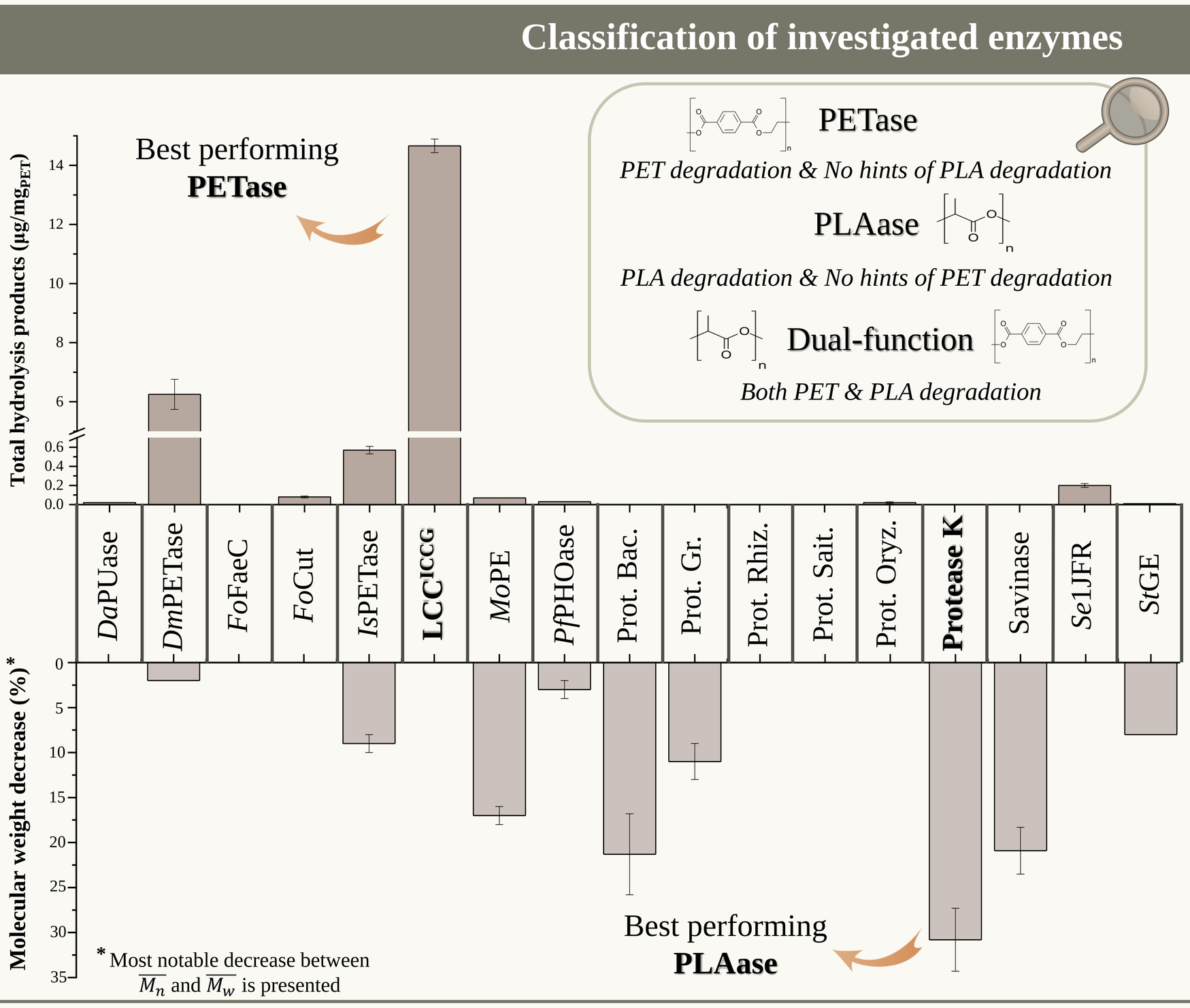
PET
Semi-crystalline PET

Degradation evaluation

Molecular weight alterations (PLA) through GPC

Hydrolysis products (PET) through HPLC

Classification of investigated enzymes



PETase
PET degradation & No hints of PLA degradation

PLAase
PLA degradation & No hints of PET degradation

Dual-function
Both PET & PLA degradation

Enzyme	Classification
*Da*PUase	PETase
*Dm*PETase	Dual-function
*Fo*FaeC	Inactive
*Fo*Cut	PETase
*Is*PETase	Dual-function
LCC^{ICCG}	**PETase**
*Mo*PE	Dual-function
*Pf*PHOase	PETase
Prot. Bac.	PLAase
Prot. Gr.	PLAase
Prot. Rhiz.	Inactive
Prot. Sait.	Inactive
Prot. Oryz.	PLAase
Protease K	**PLAase**
Savinase	PLAase
*Se*1JFR	Dual-function
*St*GE	Dual-function

Enzymes for selective degradation in polyester blends

Selective degradation of PET and PLA using **LCC^{ICCG}** and **Protease K** could purify packaging waste streams, facilitating efficient recycling and promoting sustainable waste management.

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