



Chemical Recycling of Amine-crosslinked Polyesters

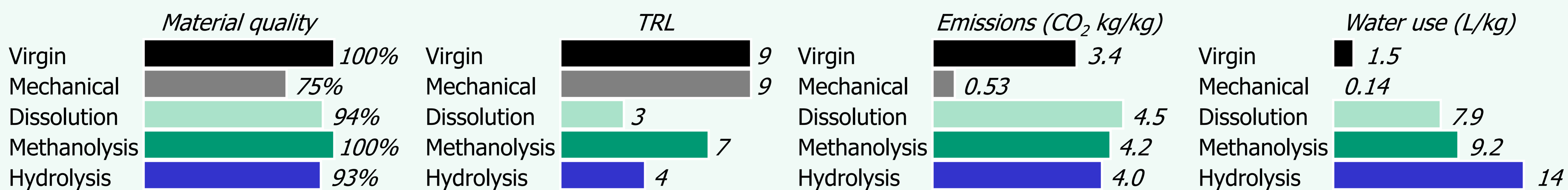
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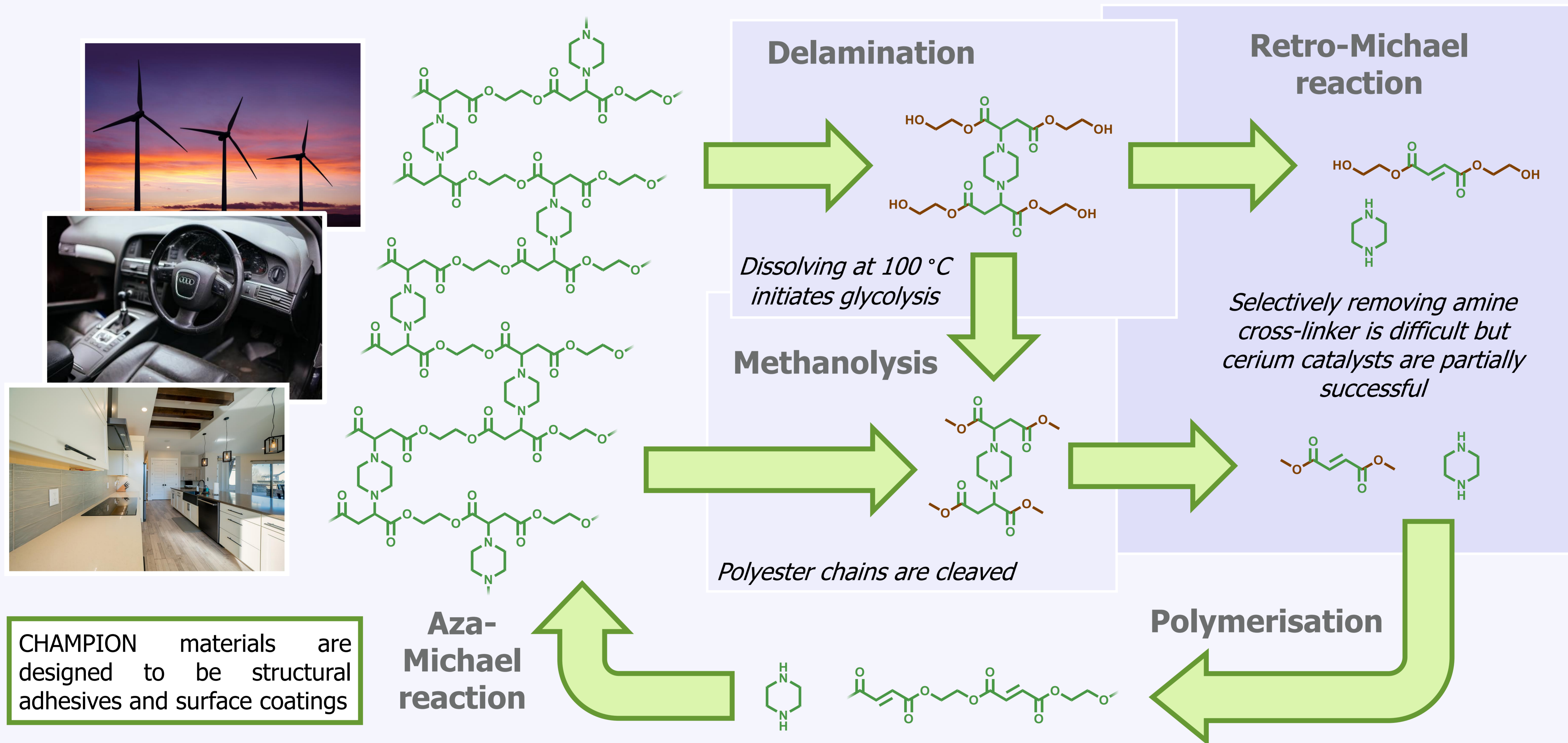
Why chemical recycling?

Chemical recycling is an alternative to mechanical recycling, allowing the recovery of monomers



For the example of PET (above), superior properties compared to mechanical recycling can be gained by extraction or chemical recycling by hydrolysis or methanolysis. However, the environmental impacts are greater.
Data from DOI: 10.1021/acssuschemeng.2c05497

Recovery of CHAMPION project materials



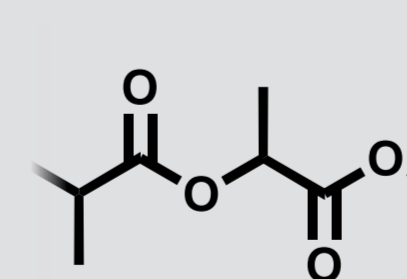
Outlook

Methanolysis was successful in returning the bio-based Michael acceptor. Zinc acetate was applied as a catalyst. Excess methanol was used as a solvent.

Methanolysis is preferred to hydrolysis because the methyl esters are more reactive in the repolymerisation stage.

Recovery of amines was challenging, with incomplete retro-aza-Michael addition observed in the presence of catalysts.

Thermal treatment was able to depolymerise the CHAMPION polymers but some of the amine cross-linkers were prone to decomposition.



Poly(lactic acid) (PLA) and PET are not reactive under the methanolysis conditions for selective chemical recycling.

CHAMPION materials are a small component of the final products. Delamination of coatings and debonding of adhesives could be used to reclaim materials. The value that can be gained from recycling the coating or adhesive is limited unless expensive amines can be recovered.