Towards Sustainable Functional Polyester Materials

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Why are polyesters so important for a sustainable future? Availability of bio-based monomers, mechanical and chemical recyclability, as well as biodegradability are promising features in terms of sustainability. But what can we do with polyesters? Since polyesters can be synthesized from numerous different monomers their physical, mechanical, and thermal properties strongly vary and can be finetuned to fulfill certain material requirements. Adding multifunctional monomers to the polyester structure allows crosslinking, modifying hydrophilicity, or introducing chelating ligands. Due to their promising properties and versatility, polyesters from mutlifunctional monomers are increasingly investigated although synthetic and analytical challenges need to be tackled.

Research on the trifunctional monomer dimethylolpropionic acid (Fig. 1) revealed that mostly linear polyesters with pendant COOH groups are formed when choosing the right reaction partners [1]. Monomer reactivities and miscibility in melt are crucial factors to identify successful synthesis procedures and obtain materials with desired properties. A reactivity study on a series of monomers was carried out to facilitate systematic investigations on multifunctional building blocks. Matching of suitable reaction components and conditions becomes significantly easier by developing a powerful toolbox of analytical methods focussing on NMR spectroscopy and MALDI mass spectrometry which fundamentally enhances the understanding of newly investigated functional polyesters.

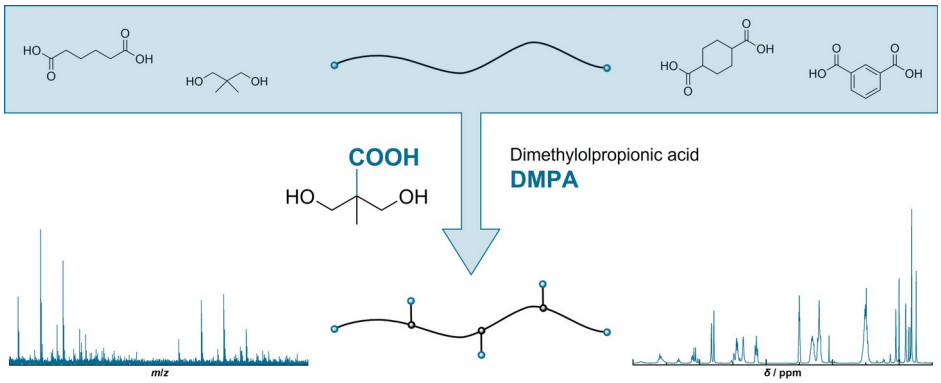

Figure 1: Polyesters with pendant carboxylic acid groups are synthesized using dimethylolpropionic acid [1].

Keywords: functional polyesters, sustainable materials, polymer spectroscopy

References

[1] Saller, K.M.; Hubner, G; Schwarzinger, C. Introducing free carboxylic acid groups along polyester chains using dimethylolpropionic acid as diol component *Eur. Polym. J.* **2023**, 198, 112442.