Supporting Information

Synthesis of degradable polyester with high molecular weight and excellent mechanical properties through copolymerization modification of poly(butylene succinate)

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1. Chemical Structures of PBS and PBTCDS

The number-average sequence lengths ($L_{n,SB}$ and $L_{n,ST}$) and the degree of randomness (R) were confirmed through ^{13}C NMR, as shown in Figure S1 and Table S1. The signals at 172.28 ppm, 64.16 ppm, 29.01 ppm and 25.20 ppm were affiliated with the carbon of carbonyl (A), -OCH_2 (B), -$CO\underline{\boldsymbol{C}}H_2$ (C) and -CH_2 (D) of PBS [1], respectively. The carbon of -$CO\underline{\boldsymbol{C}}H_2$ (C) was selected for the study of the sequence distribution, and the $L_{n,SB}$, $L_{n,ST}$, and R were calculated according to the following Equations (1)-(3) [1].

$$L_{n,SB} = 1 + 2I_{C1}/ I_{C2} \quad (1)$$

$$L_{n,ST} = 1 + 2I_{C3}/ I_{C2} \quad (2)$$

$$R = 1/ L_{n,SB} + 1/ L_{n,ST} \quad (3)$$

Where I_{C1}, I_{C2}, and I_{C3} represent the integrated intensities of SB/SB, SB/ST, and ST/ST, respectively. Only the C peak exhibits splitting, resulting in C1 and C2. This may be attributed to the high boiling point of TCD, which prevents it from escaping during the polycondensation process, thus preventing the formation of ST/ST segments and making it impossible to detect the C3 peak. Consequently, I_{C3} is set to 0.

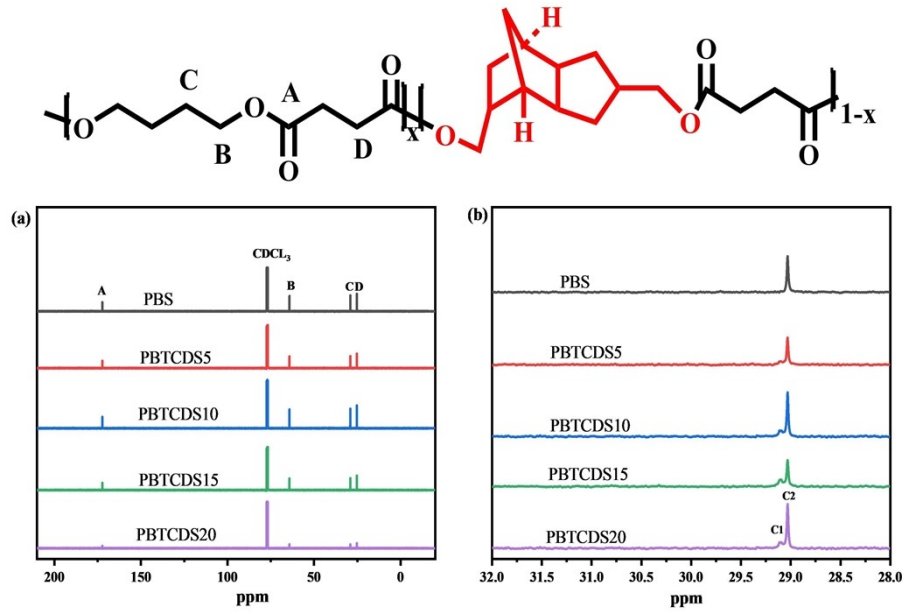

Figure S1 (a) ^{13}C NMR spectra of PBS and PBTCDSx, and (b) amplified images of the spectra between 28.0 and 32.0 ppm.

Table S1 Composition and molecular weight degree of PBS and PBTCDSx

Sample	[a]$L_{n,SB}$	$L_{n,ST}$	R
PBS	-	-	-
PBTCDS5	1.44	1	1.69
PBTCDS10	1.70	1	1.58
PBTCDS15	2.04	1	1.49
PBTCDS20	2.96	1	1.34

2. SEM micrographs before and after hydrolytic degradation

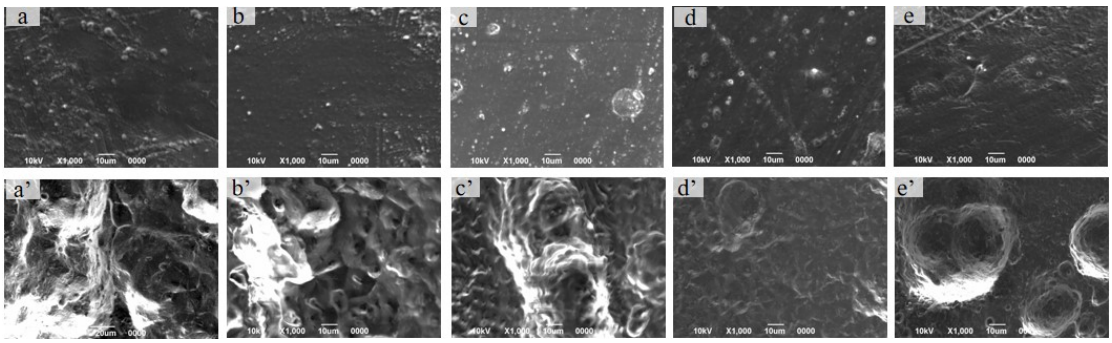

Figure S2 SEM images of film surface before and after degradation of 20 days at 40℃ and pH=14 for PBS (a and a'), PBTCDS5 (b and b'), PBTCDS10 (c and c'), PBTCDS15(d and d'), PBTCDS20 (e and e')

3. Thermal properties of PBTCDSx polyester

Table S2 Thermal properties of the first heating scan of PBS and PBTCDSx

Sample	T_m (℃)	ΔH_m (J/g)
PBS	122.1	73.52
PBTCDS5	111.1	70.14
PBTCDS10	98.5	31.89
PBTCDS15	92.8	35.46
PBTCDS20	81.3	27.08

4. Mechanical properties of PBTCDSx polyester

Table S3 The yield modulus of the PBS and PBTCDSx

Sample	Yield stress (MPa)
PBS	34.5±0.7
PBTCDS5	22.3±0.6
PBTCDS10	19.3±0.6
PBTCDS15	13.3±0.6
PBTCDS20	9.3±0.6

REFERENCES

[1] Hu, H.; Tian, Y.; Kong, Z.; Ying, W. B.; Zhu, J. A high performance copolyester with "locked" biodegradability: Solid stability and controlled degradation enabled by acid-labile acetal. ACS Sustainable Chem. Eng. 2021, 9 (5).