Supporting Information

Degradation of Plastics under Anaerobic Conditions: A Short Review

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Table S2. Summary of experimental conditions and results.

Reference	Type plastic	Degradation	Co-sustrate	Working volume	Temperature	Duration	Scale	% Biodegradation	Biogas
[1]	Polypropylene Low density polyethylene Cellulose-based metallized Cellulose-based heat- sealable Cellulose-based non heat-sealable Starch-based film blend 1 Starch-based film blend 2 Poly lactic Acid Film	Anaerobic digestion	Post-consumer domestic food waste and card packaging at a ratio of 80:20% on a fresh weight basis	4.5 L	37 °C	147 day	Laboratory	-	-
[2]	Poly (3-hydroxybutyrate-co-3-hydroxyhexanoate)	Anaerobic digestion	-	500 mL	38 °C	85 days	Laboratory	-	-
[3]	Polystyrene (PS) Polypropylene (PP) High density polyethylene (HDPE) Wooden chopsticks (WC)	Anaerobic digestion	Food waste	1000 mL	35 °C	30-35 days	Laboratory	-	-
[4]	Poly (hydroxybutyrate-co-hydroxyvalerate) (PHBV) Poly (hydroxybutyrate-co-hydroxyvalerate) (PHBV) with wood fiber (WF)	Anaerobic digestion	-	600 mL	37 °C	84 days	Laboratory	-	-
[5]	Rice straw/low-density polyethylene (RS/LDPE)	Anaerobic digestion		5 L	37 °C	30 days	Laboratory	-	71800 mL
[6]	Poly (hydroxybutyrate- co-hydroxyvalerate) (PHBV) Composites with wood fiber (WF) (0%, 20%, 40%)	Anaerobic digestion		600 mL	37 °C	56 days	Laboratory	-	-
[7]	Poly (hydroxybutyrate-co-hydroxyvalerate) (PHBV)	Anaerobic digestion	-	600 mL	37 °C	42 days	Laboratory	86%	-
[8]	Poly (lactic acid) (PLA)	Anaerobic digestion	40 mM acetate was augmented in phase I, 4 mM in phase II and finally 0 mM in phase III	250 mL	37 °C	30 days	Laboratory	-	0.35 mmol/day m^2

Reference	Type plastic	Degradation	Co-sustrate	Working volume	Temperature	Duration	Scale	% Biodegradation	Biogas
[9]	Poly (lactic acid) (PLA), Poly (hydroxybutyrate-co-hydroxyvalerate) (PHBV), Poly (butylene succinate) (PBS), and poly (butylene adipate-co-terephthalate) (PBAT)	Landfill	Waste solid	660 mL	52 °C	75 days	Laboratory	-	-
[10]	High-density polyethylene (HDPE) with the totally degradable plastic additives (TDPA) Polyethylene (PE) labeled as 100% degradable Compostable Starch and Polycaprolactone	Landfill	Municipal waste	Real	6.2 -20.8	2 years	Landfill	-	-
[11]	Poly (L-lactic acid) (PLA) Poly (ε-caprolactone) (PCL)	Anaerobic digestion	-	120 mL	55 °C	150 days	Laboratory	PCL 74%, PLA 62%	PLA 676–677 mL/g TS
[12]	Starch/polyvinyl alcohol (PVA) blend	Anaerobic digestion	-	1 L	35 °C	26 days	Laboratory	52.09% ± 0.95%	(7980 ± 20 mL)
[13]	Poly (lactic acid) (PLA) PLA blend	Anaerobic digestion	-	250 mL	37 °C	30 days	Laboratory	-	0.0068 mmol/day m^2
[14]	Polyethylene (PE) Biodegradable polyester	Anaerobic digestion	-	200 mL	-	98 days	Laboratory	-	-
[15]	Poly vinyl chloride (PVC)	Anaerobic digestion	-	650 mL	37–38 °C	7 days	Laboratory	-	7.7 mL
[16]	Poly (butylene succinate) (PBS)	Anaerobic digestion		250 mL /100 mL	55–37 °C	113 days	Laboratory	-	-
[17]	Polycaprolactone (PCL)/eggshell (ES) biocomposite (50/50 w/w)	Anaerobic digestion	-	-	43 °C	8 weeks	Laboratory	-	-
[18]	High/low density polyethylene, HDPE/LDPE Poly- propylene, PP Polystyrene, PS	Landfill	Stabilized organic wastes	Diameter of 5 cm and length of 150 cm	28–30 °C	357 days	Laboratory	-	-
[19]	Poly (lactic acid), polyhydroxybutyrate-co-polyhydroxyvalerate and low density polyethylene	Anaerobic digestion	-	120 mL	36 °C	28 days	Laboratory	-	936.6 ml/g PHB/PHV
[20]	Polyethylene (PE)	Anaerobic digestion	Household waste	125 mL	35 and 50 °C	464 days	Laboratory	-	-

Reference	Type plastic	Degradation	Co-sustrate	Working volume	Temperature	Duration	Scale	% Biodegradation	Biogas
	Polyethylene terephthalate (PET)								
[21]	Poly (ethylene terephthalate-co-lactate) copolyesters	Anaerobic digestion	-	120 mL	55 °C	394 days	Laboratory	-	-
[22]	Polyethylene sample with the additive Polyethylene (PE) labeled as 100% degradable Compostable Starch and Polycaprolactone	Landfill	Waste solid	Real	3.4-20.58 °C	1 year	Real	No modification of structure	-
[23]	Polyurethane (PU) foams made from crude glycerol Polyurethane (PU) Petroleum- based polyols	Anaerobic digestion	-	2 L	37 °C	105 days	Laboratory	PU foams made from bio-based 8.95% blend polyols 8.5%	-
[24]	Poly-3-hydroxybutyrate-co-3-hydroxyvalerate (PHBV) copolymer as a biodegradable additive in polypropylene (PP)	Anaerobic digestion	-	-	25, 35, 45, 55 °C	28 days	Laboratory	-	-
[25]	Poly (caprolactone) (PCL) Poly (lactic acid) (PLA) Polyhydroxybutyrate (PHB) Poly (butylene succinate) (PBS)	Anaerobic digestion	-	1.5 L	37 °C	277 days	Laboratory	PCL: 12.5% PLA: 39% PHB: 92.5% PBS: 0	2.07 L 4.05 L 10.61 L
[26]	Blend of polypropylene (PP) with 2% additive Blend of polyethylene terephthalate (PETE) with 1% additive Plastarch[1] Co-polyester þ corn-based plastic	Anaerobic digestion	the organic fraction of municipal solid waste	2 L	37 °C	50 days	Laboratory	Blend of polypropylene (PP) with 2% additive 3.1 Blend of polyethylene terephthalate (PETE) with 1% additive 2.2 Plastarch[1] 26.4 Co-polyester þ corn-based plastic 20.2	-
[27]	Polycaprolactone (PCL) Poly (lactic acid) (PLA) Polyhydroxybutyrate (PHB) Poly (butylene succinate) (PBS)	Anaerobic digestion	-	2 L	55 °C	50 days	Laboratory	PHB 90% PCL 80% PLA 75%	PHB 10.25 L PCL 9.93 L PLA 7.41 L PBS 0.54 L

Reference	Type plastic	Degradation	Co-sustrate	Working volume	Temperature	Duration	Scale	% Biodegradation	Biogas
								PBS could not be anaerobically biodegraded	
[28]	Poly lactide (PLA) semicrystalline, one amorphous	Anaerobic digestion Landfill	high amount of pre-treated municipal solid waste fraction	2 L	35 °C 21 °C	170 days 13 months	Laboratory	Anaerobic digestión : amorphous PLA 36% Landfill: not biodegraded	-
[29]	Poly (lactic acid) (PLA	Anaerobic digestion	-	1.5 L	55 °C	57 days	Laboratory	77.25%	7.07 L
[30]	Polypropylene (PP)	Landfill	50% biosolids and 50% (volume basis) municipal solid waste (MSW)	208 L	35 °C, 45 °C, and 60 °C	52 weeks	Pilot	-	-
[31]	Poly (caprolac- tone) (PCL)-starch blend Poly (butylene succinate) (PBS)	Anaerobic digestion Landfill	- Municipal solid waste	250 mL Landfill	35 °C	139 days 90 days	Real landfill	PCL-starch blend 83% PBS 2% Physical deterioration	669 mL-CH_4/g-VS 11 mL-CH_4/g-VS
[32]	poly(lactic acid) (PLA)	Anaerobic digestion	-	1.5 L	55 °C	45 days	Laboratory	70%	7.16 L
[33]	poly(3-hydroxybutyrate-co-3-hydroxyhexanoate)	Anaerobic digestion	-	50 mL	37 °C	12 days	Laboratory	95%	-
[34]	starch–polyvinyl alcohol (PVOH)	Anaerobic digestion	-	165 mL	37 °C	115 days	Laboratory	60%	-
[35]	Poly lactide (PLA) 100% Poly lactide (PLA) 70%	Anaerobic digestion	Kitchen garbage and ammonia	1 L	80 °C and 55 °C	22 days	Laboratory	PLA (100%) 81.8% PLA (70%) 77.0%	-
[36]	Poly lactic acid (PLA) with Poly (propylene glycol) (PPG)	Anaerobic digestion	-	-	35 and 50 °C	~182 days	Laboratory	90%	-
[37]	Poly (lactic acid) (PLA)	Anaerobic digestion	-	1.5 L	37 and 55 °C	100 days	Laboratory	91.5%	8.92
[38]	Poly lactic acid (PLA) Gamma-irradiated	Anaerobic digestion	-	280 mL	37 and 58 °C	56 days	Laboratory	37 °C: 0.19% 58 °C: 98.96 *gamma-irradiated PLA lost 45%*	-
[39]	Poly hydroxybutyrate (PHB)	Anaerobic digestion	-	240 mL	35 °C	32 weeks	Laboratory	100	-
[40]	Starch: poly vinyl alcohol (TPS: PVOH) w/w%: 90:10, 75:25, 50:50, 0:100	Anaerobic digestion	-	200 mL	38 °C	100 h	Laboratory	-	-

Reference	Type plastic	Degradation	Co-sustrate	Working volume	Temperature	Duration	Scale	% Biodegradation	Biogas
[41]	Poly lactide (PLA)-based Rubbish collection bags (50% PLA) Fresh-keeping bags (90% PLA) Drinking cups (80%PLA)	Anaerobic digestion	Synthesized kitchen waste (Cabbage, Potato, Apple, Carrot , Fish, Pork (raw) , Rice, Tea leaves, Used paper,	1 L	52 °C	8 weeks	Laboratory	PLA (50%): 37% PLA (90%) 80% PLA (80%): 52%	PLA (50%): 276 NL/kg-VS PLA (90%): 598 NL/kg-VS PLA (80%): 389 NL/kg-VS
[42]	Poly (lactic acid) (PLA)	Anaerobic digestion	-	1.5 L	37 and 55 °C	75 days	Laboratory	PLA (35 ºC): 21% PLA (55ºC): 93%	PCL: 10.6 L PLA: 6.86
[43]	Poly (lactic acid) (PLA) Poly caprolactone (PCL)	Anaerobic digestion	-	1.5 L	55 °C	75 days	Laboratory	PCL: 92% PLA: 79%	PCL: 10.6 L PLA: 6.86
[44]	Poly lactic acid (PLA)	Landfill	Municipal solid waste	-	-	15 months	real conditions	-	-
[45]	Degradable plastic additive 3% Biodegradable synthetic resin	Anaerobic digestion	-	1 L	-	32 days	Laboratory	Plastic with additive: 0.02 Biodegradable synthetic resin: 26.9	245 ml MB
[46]	Polyurethane (PU)	Anaerobic digestion	-	1 L	-	45 days	Laboratory	0	-
[47]	Poly (vinyl chloride) (PVC)	Landfill	Municipal solid waste	Real	35 °C	90 days	Real conditions	-	-
[48]	Poly (vinyl chloride) (PVC)	Landfill	Artificial municipal solid waste	5 L	20, 37, 55 and 70 °C	40 days	Laboratory	-	-
[49]	Polycaprolactone (PCL) Polylactic acid (PLA) Blend starch C polycaprolac-tone Poly (butadiene adipate-co-terephthalate)	Anaerobic digestion	-	250 mL	35 °C	28 days	Laboratory	-	-
[50]	polyhydroxybutyrate (PHB) (hydroxybutyrate-*co*-hydroxyvalerate) (PHBV) Poly (ε-caroplacton) (PCL)	Anaerobic digestion	-	-	37 °C	42 days	Laboratory	PHB: 100 PHBV: 57 PCL: 30	-

Reference	Type plastic	Degradation	Co-sustrate	Working volume	Temperature	Duration	Scale	% Biodegradation	Biogas
[51]	polyhydroxybutyrate and hydroxyvalerate (PHBV) polycaprolactone plastic (PCL) Blend of starch and polyvinyl alcohol (SPVA) ellulose acetate (CA)	Anaerobic digestion Landfill	Synthesized waste which contained equivalent weights of yard waste, kitchen garbage, paper waste, dry dog-food, dewatered sludge and soil	300 mL	-	120 days	Laboratory	PHBV: 100%	-
[52]	Poly(3-hydroxybutyrate-*co*-3-hydroxyoctanoate), PHBO C-PCL (poly-ε-caprolactone)	Anaerobic digestion Landfill	Mixture of shredded fresh MSW	500mL	35 °C 38 °C	721 days	Laboratory	PHBO: 45.2 C-PCL: 40	-
[53]	Polyhydroxybutyrate and hydroxyvalerate (PHBV) Polyhydroxybutyrate (PHB)	Anaerobic digestion	-	1 L	37 °C	-	Laboratory	-	-
[54]	Poly (vinyl chlor- ide) PVC	Landfill	Household waste	100 L	30 °C	4 years	Laboratory	-	-
[55]	Poly (vinyl chloride) (PVC)	Landfill	Household waste	100 L	30 °C	-	Laboratory	-	-
[56]	low-density polyethylene film (LDPE)	Landfill	-	-	25, 50, 80 and 105 °C	-	Laboratory	-	-
[57]	low-density polyethylene film (LDPE) /rice starch	Landfill	-	-	37 °C	180 days	Laboratory	LDPE/rice starch (60/40): 21.4	-
[58]	Lignified cellulose (LC), a citric acid cross-linked cellulose (x-C),	Landfill	Fresh refuse, and decompod refuse	2 L	38 °C	6 months	Laboratory	LC: 25.67 XC: 52.04	-
[59]	low-density polyethylene film (LDPE) Starch	Landfill	-	-	37 °C	180 days	Laboratory	LDPE/starch (60/40): 27.3	-
[60]	Poly-3-hydroxybutyrate-co-3-hydroxyvalerate (PHBV)	Anaerobic digestion	-	500 mL	35 °C	30 days	Laboratory	90%	-
[61]	Poly (3-hydroxy- butyrate-co-3-hydroxyvalerate) (PHB/HV; 92/8, w/w) Poly-lactic acid	Anaerobic digestion Landfill	Synthetic MSW	160 mL	35 °C	100 days 6 months	Laboratory	89% PHB/HV: 80%	-
[62]	Starch acetates	Anaerobic digestion	Municipal solid waste	3.5 L	37 °C	90 days	Laboratory	-	-
[63]	Poly-β-hydroxyalkanoates	Anaerobic digestion	-	125 mL	15 °C	-	Laboratory	-	-
[64]	Polylactic acid Polylactone, and poly(hydroxy butyrate/valerate) Starch/PE	Anaerobic digestion	-	160 mL	35 °C	40 days	Laboratory	-	-

Reference	Type plastic	Degradation	Co-sustrate	Working volume	Temperature	Duration	Scale	% Biodegradation	Biogas
[65]	Poly-ε-caprolactone	Anaerobic digestion	-	-	30 °C	7 days	Laboratory	-	-
[66]	Low-density polyethylene film (LDPE) starch-based/between 70 and 90% starch	Anaerobic digestion	--	119 mL	30 °C	28 days	Laboratory	-	-
[67]	Low-density polyethylene (LDPE) LDPE + 5.5% cornstarch Linear low-density polyethylene (LLDPE) LLDPE + 5.5% cornstarch	Landfill	Municipal solid waste	-	10 °C	2 years	Real conditions	-	-
[68]	Poly (3-hydroxybutyrate) Copolymerpoly(3-hydroxybutyrate-co-3-hydroxyvalerate)	Anaerobic digestion	-	59 mL	35 °C	16 days	Laboratory	PHB: 87 P (HB-co-13%HV): 96 P (HB-co-20%HV): 83	PHB: 0.20 mmol P(HB-co-13%HV): 0.23 mmol P(HB-co-20%HV): 0.20 mmol
[69]	Copolymer of cellulose acetate Polystyrene maleic anhydride (50/50%)	Anaerobic digestion	-	155 mL	37 °C	98 days	Laboratory	-	-
[70]	Polyethylene (PE) + 6% starch (A; B, and C) PE +10-12% starch PHB/PHV PVA	Anaerobic digestion	-	-	58 °C	60 days	Laboratory	PHB/PHV: 91.4	-

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