

Supporting Information

Electron Beam Mediated Crosslinking of Blown Film Extruded Biodegradable PGA/PBAT Blends towards High Toughness and Low Oxygen Permeation

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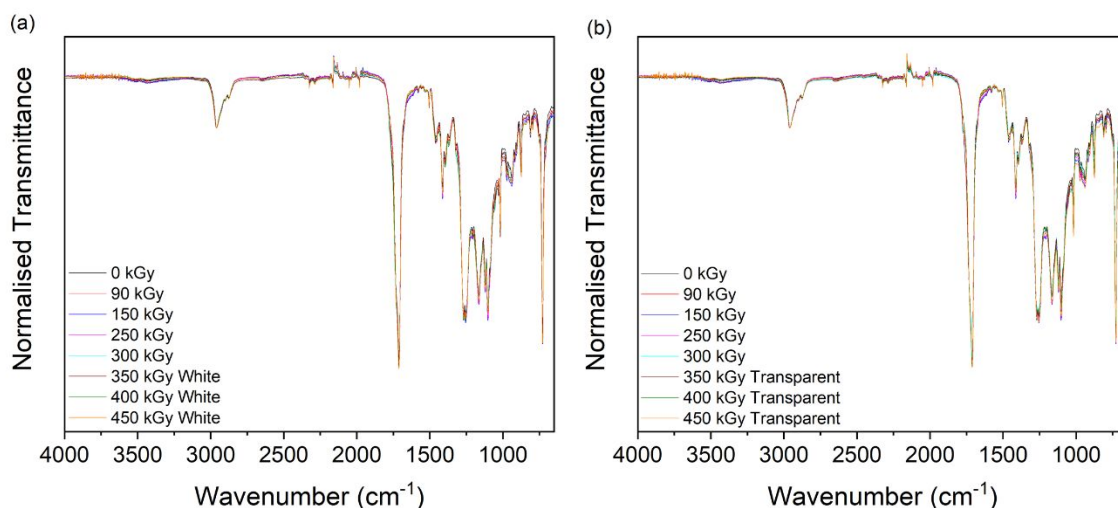


Figure S1. FTIR spectra of 20/80 PGA/PBAT + 2% GMA polymer films post electron beam treatment with a dosage of 450 kGy for, (a) white regions on the surface of the polymer films and (b) the regions away (transparent) of the polymer films.

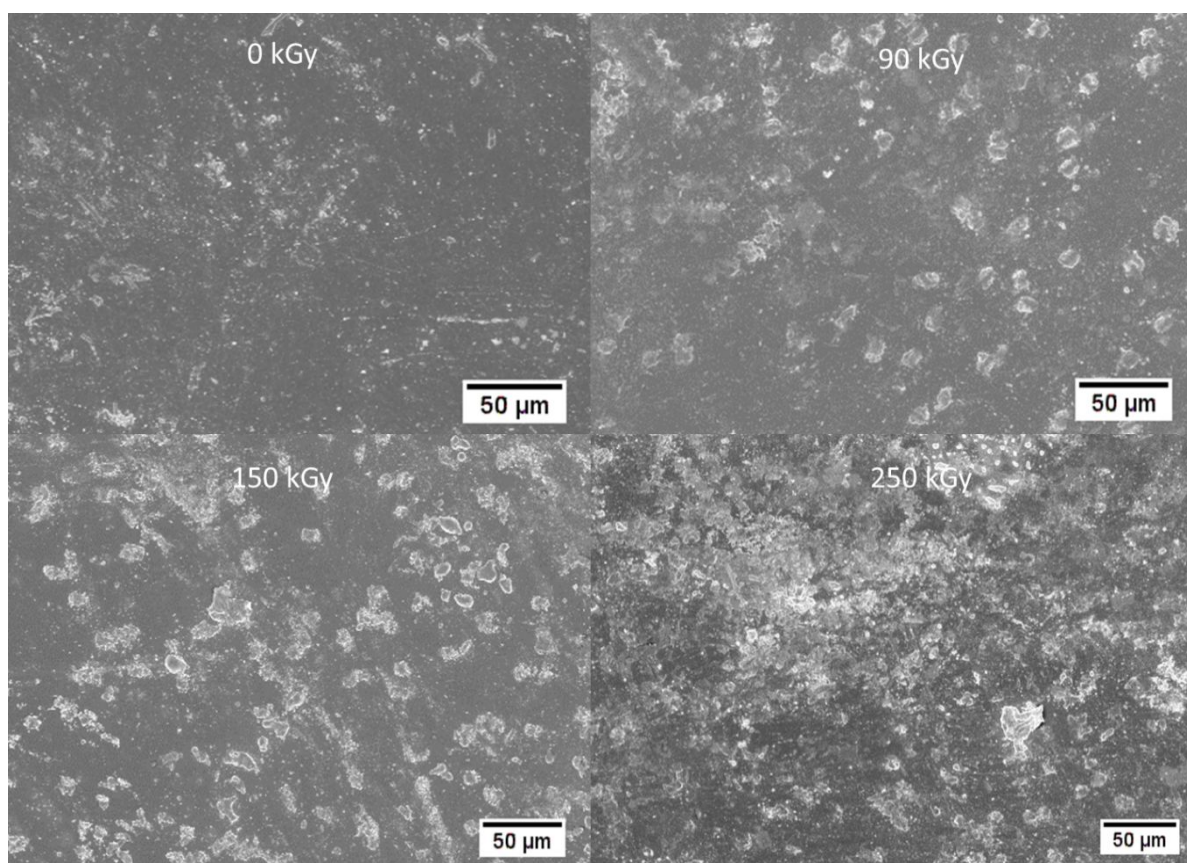


Figure S2. SEM images of electron beam treated 20/80/2 (PGA/PBAT/GMA) film surface at different dosage levels 0 kGy, 90 kGy, 150 kGy and 250 kGy.

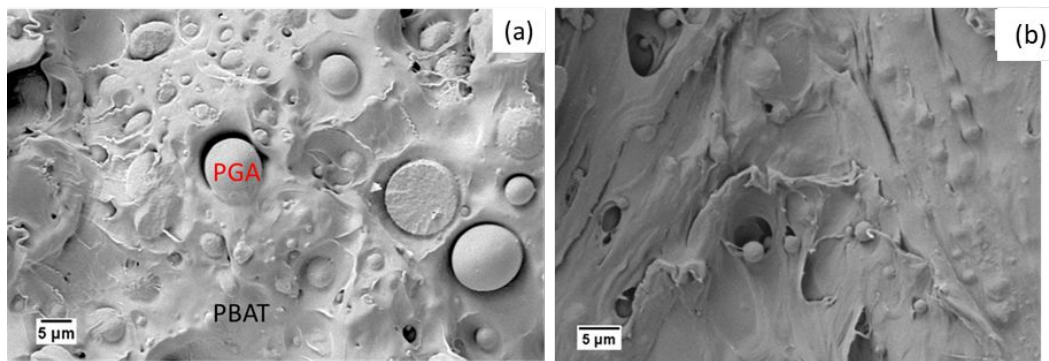


Figure S3: SEM images of cross-section of (a) PGA/PBAT (20/80) and (b) PGA/PBAT/GMA (20/80/2) blend films

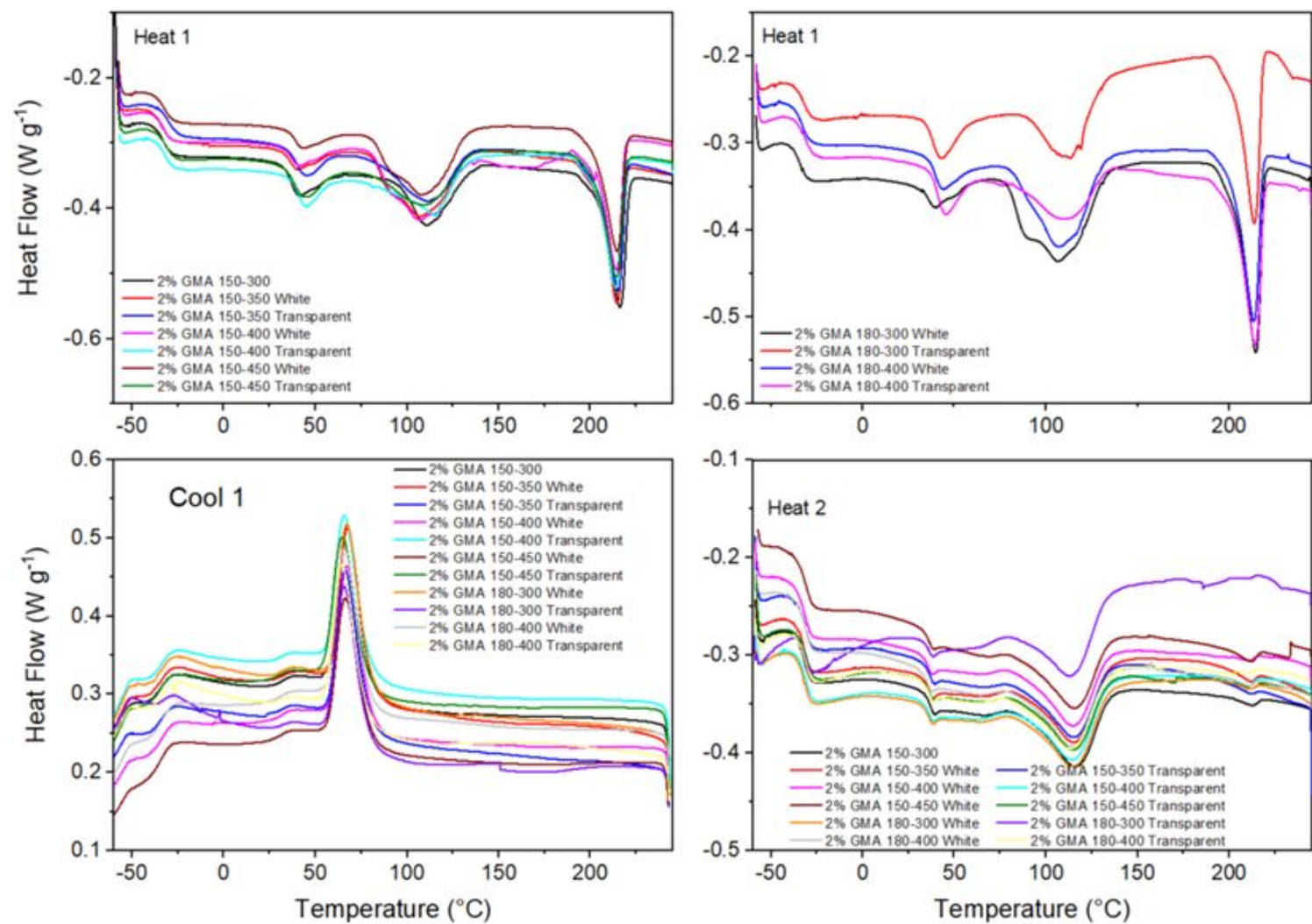


Figure S4: DSC curves of PGA/PBAT/GMA films after e-beam treatment

Table S1. Values for T_m and $\%X_c$ determined from DSC second heating curves for 20/80 PGA/PBAT +2% GMA.

Sample	Second Heating Cycle			
	PGA		PBAT	
	T_m	$\%X_c$	T_m	$\%X_c$
PGA	221.32	47.2	-	-
PBAT	-	-	118.64	11.1
PGA/PBAT 20/80	211.00	19.62	125.54	9.65
+2% GMA	-	-	119.48	12.23
90 kGy	-	-	118.83	11.91
150 kGy	210.94	0.52	118.67	11.50
250 kGy	209.06	1.42	118.13	11.82
300 kGy	212.36	1.20	116.22	12.48
350 kGy White	211.73	1.28	115.91	12.12
350 kGy Transparent	211.38	0.52	115.40	11.73
400 kGy White	211.07	0.41	115.42	12.11
400 kGy Transparent	210.39	0.51	115.07	12.14
450 kGy White	211.53	1.72	115.38	12.12
450 kGy Transparent	211.36	0.55	115.38	11.68

Table S2. Summary of tensile properties for PGA, PBAT and 20/80 PGA/PBAT blends before EBT.

Sample	Elastic Modulus (MPa)	Tensile Strength (MPa)	Strain at break (%)	Tensile Toughness (MPa)
PGA	7600 ±1200	124 ±21.4	3 ±5.8	291 ±55.0
PBAT	101 ±30.0	24 (±1.9)	774 ±61.3	54 ±2.9
PGA/PBAT 20/80	204 ±10.0	9.2 (±1.1)	37.3 ±2.1	1.3 ±1.5

Table S3. Oxygen transmission rates and permeability coefficients for PGA/PBAT 20/80 + 2% GMA films after EBT at 350 kGy, 400 kGy and 450 kGy.

Sample	Thickness (µm)	OTR1 (cm ³ m ⁻² 24 h ⁻¹)	P'O ₂ 1 (cm ³ mm m ⁻² 24 h ⁻¹)	OTR2 (cm ³ m ⁻² 24 h ⁻¹)	P'O ₂ 2 (cm ³ mm m ⁻² 24 h ⁻¹)
350 kGy	98.6±8.6	619.42±70.2	61.07±6.9	606.41±64.8	59.79±6.4
400 kGy	96.7±3.7	622.48±68.8	56.46±6.2	676.75±59.1	61.38±5.4
450 kGy	113.4±18.1	442.15±51.6	58.98±6.9	429.39±50.8	57.28±6.8