Supporting Information

Polyfuranic frame networks with elastomeric behaviour based on humins biorefinery by-products

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1. Differential scanning calorimetry

Table S1. Results of DSC analysis for humins/PEGDE and humins/GDE polymerization

	H80/P20	H70/P30	H60/P40	H50/ P50	H80/G20	H70/G30	H60/G40	H50/ G50
T_{peak} (°C) and reaction interval	203 ± 1 (115-247)	225 ± 1 (120-257)	160 ± 1 (135-173)	157 ± 1 (122-178)	215 ± 1 (95-255)	215 ± 1 (116-268)	221 ± 1 (115-267)	225 ± 1 (118-266)
			244 (215-262)	242 (190-262)				
$\Delta_r H$ (J.g $^{-1}$)	112 ± 2	111 ± 2	8 ± 1	6 ± 1	239 ± 4	301 ± 4	300 ± 4	145 ± 4
			28 ± 1	50 ± 1				

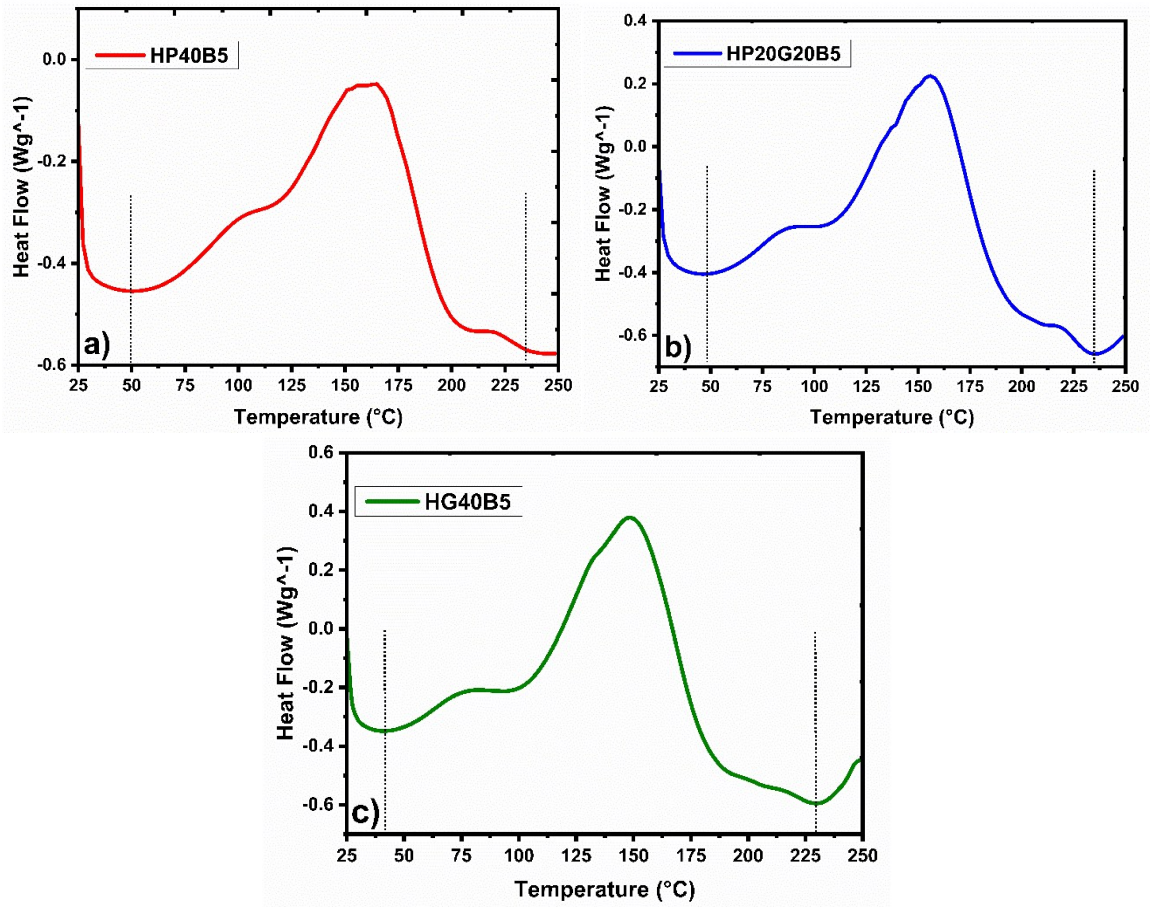

Figure S1. DSC analyses for uncured mixtures: a) 55 % H- 40 % PEGDE- 5 % BDMA, b) 55% H- 20 % PEGDE- 20 % GDE- 5 % BDMA, c) 55 % H- 40 % GDE- 5 % BDMA

2. FT-Infrared Spectroscopy

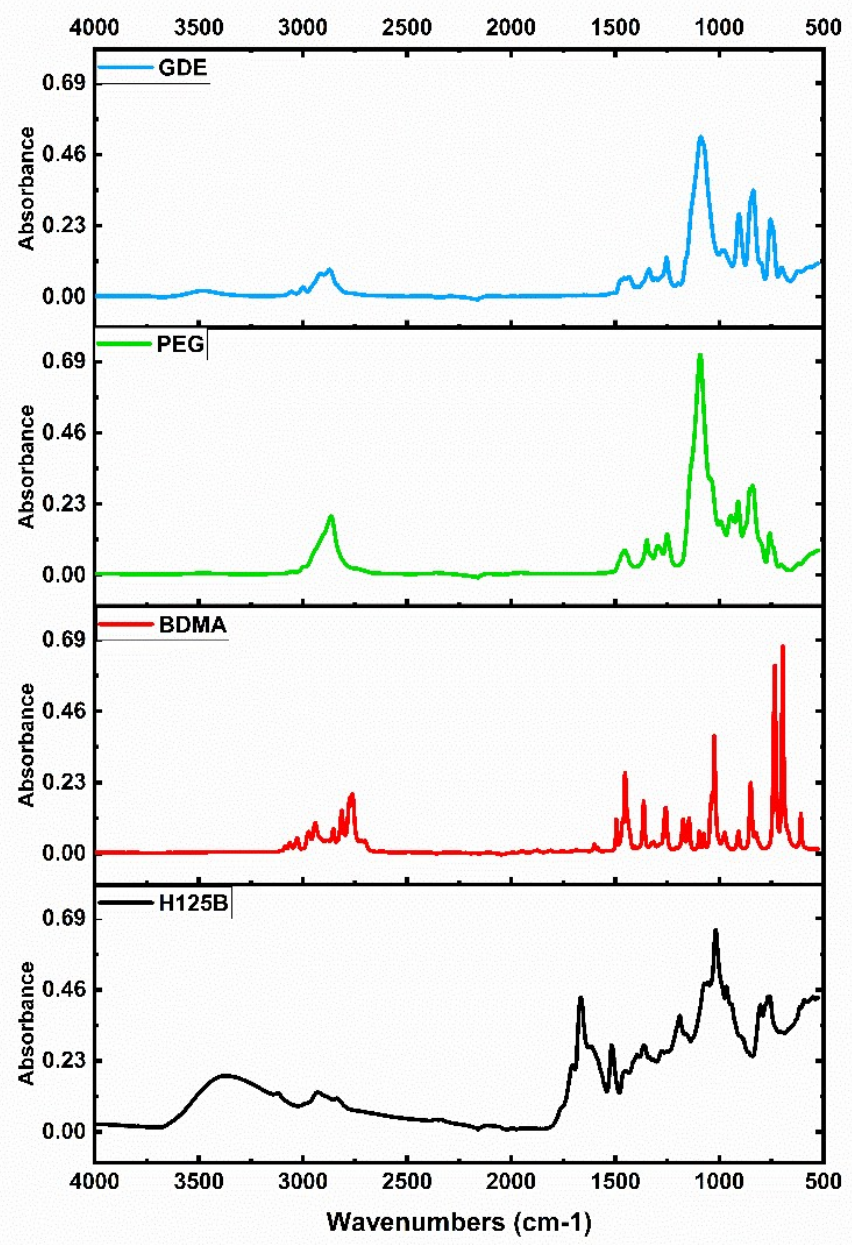

Figure S2. FT-IR spectra of raw materials

3. Rheometry studies

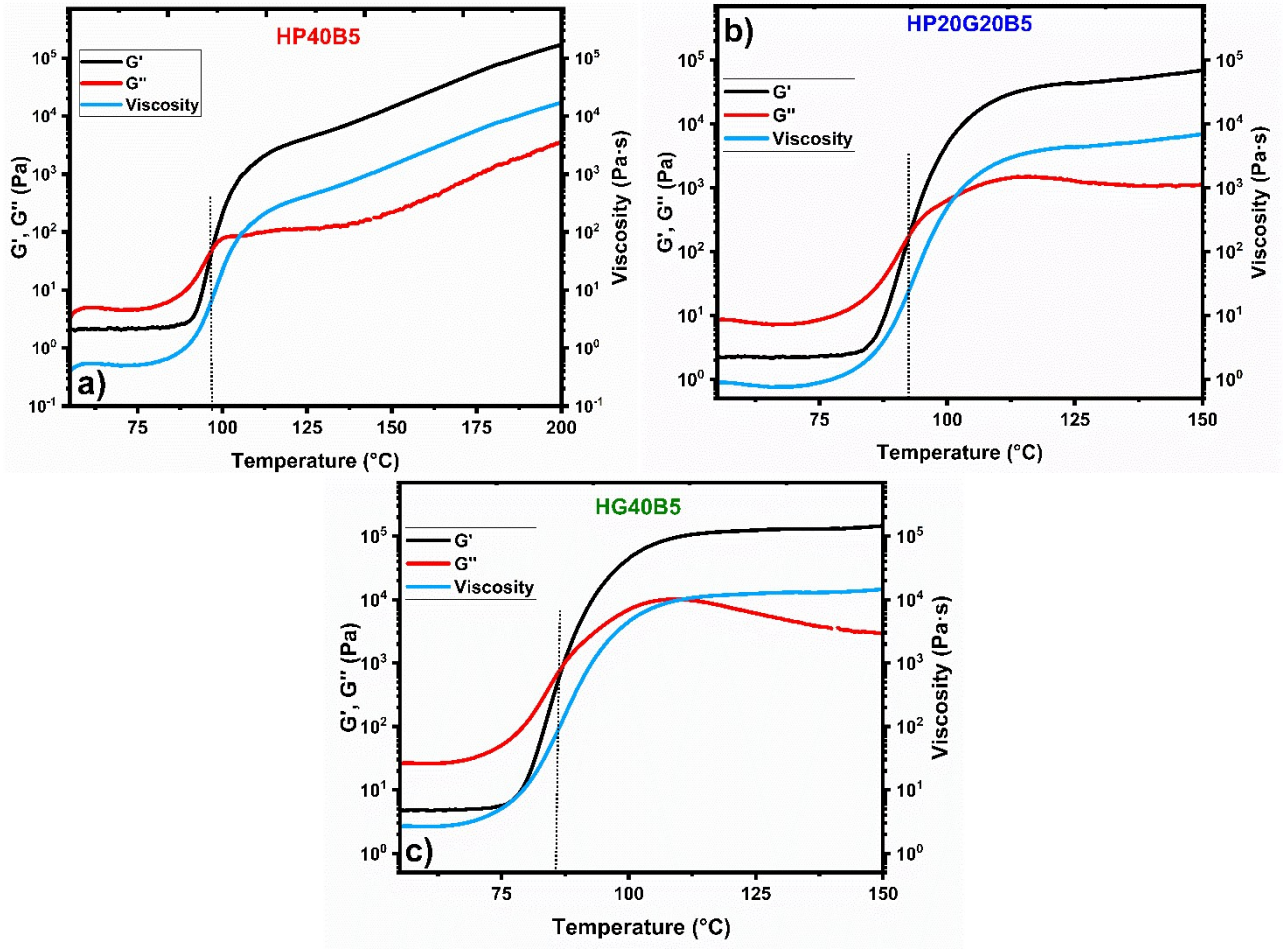

Figure S3. Rheometry study of the copolymerization systems: a) 55% H- 40% PEGDE- 5% BDMA, b) 55% H- 20% PEGDE- 20% GDE- 5% BDMA, c) 55% H- 40% GDE- 5% BDMA

Table S2. Rheological data for copolymerization of the three formulations

No	Resins	Gelling point (°C)	Start of reaction (°C)	End of reaction (°C)
1	**HP40B5**	98	75	125
2	**HP20G20B5**	92	73	120
3	**HG40B5**	86	65	115

4. Dynamical mechanical analysis

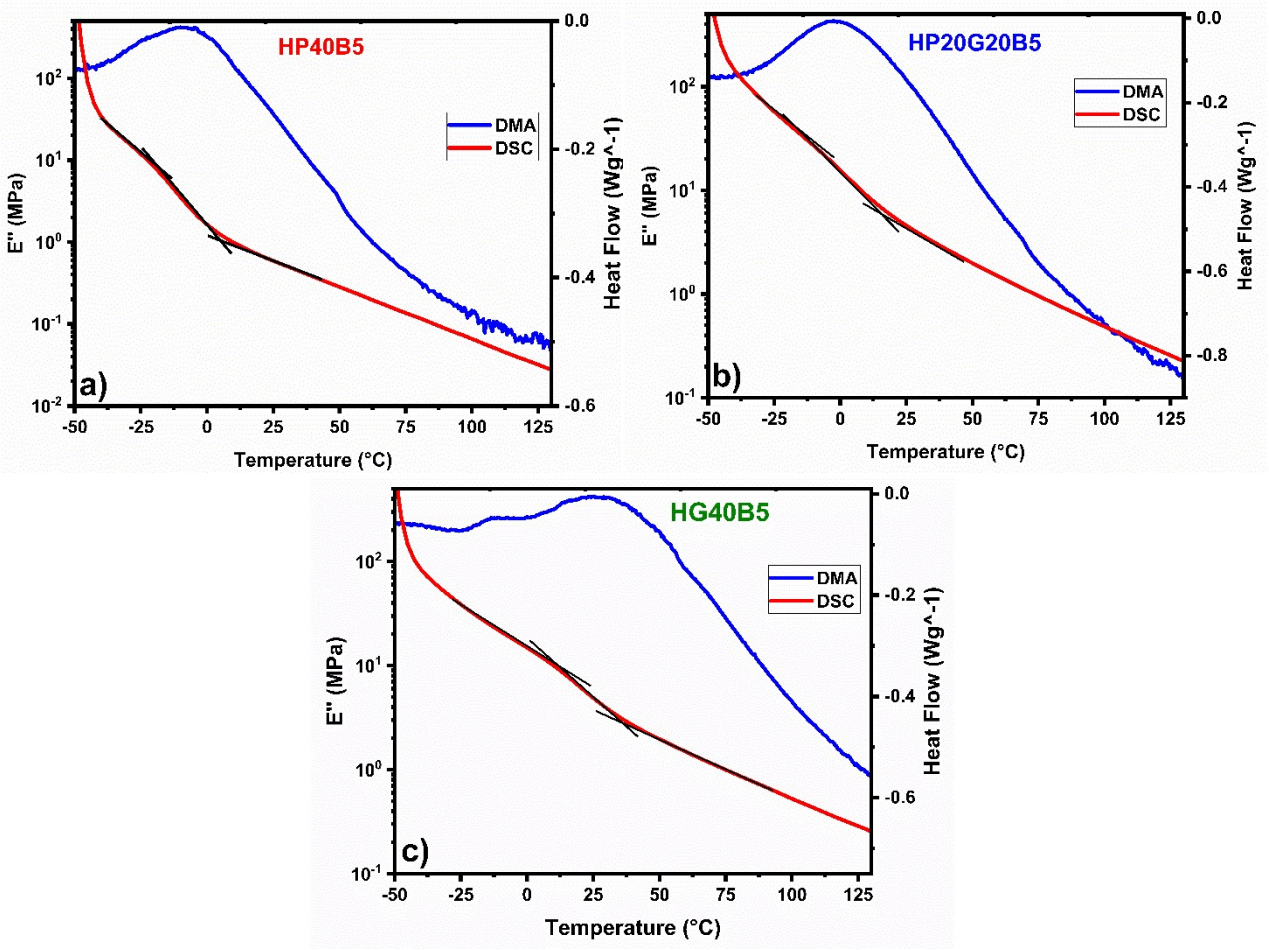

Figure S4. DMA mechanical response of materials as compared to DSC scans showing the glass transition temperature for the copolymerized humins-based resins

Table S3. Temperatures and related storage modules for cross-link density determination

	Tan δ + 80 °C (°C)	E' at Tan δ + 80 °C (MPa)	υ (mmol·cm^{-3})
HP40B5	110	0,7	0.07
HP20G20B5	130	4.36	0.43
HG40B5	146	5,81	0.56

Table S4. Sub-glass transitions of the humins-based copolymers

Sample	T_γ (°C) max / peak height	T_β (°C) max / peak height
HP40B5	-131 / 0.019	-73 / 0.03
HP20G20B5	-130 / 0.014	-71 / 0.03
HG40B5	-133 / 0.019	β -47 / 0.03
		β' -12 / 0.17

5. Thermal gravimetric analysis

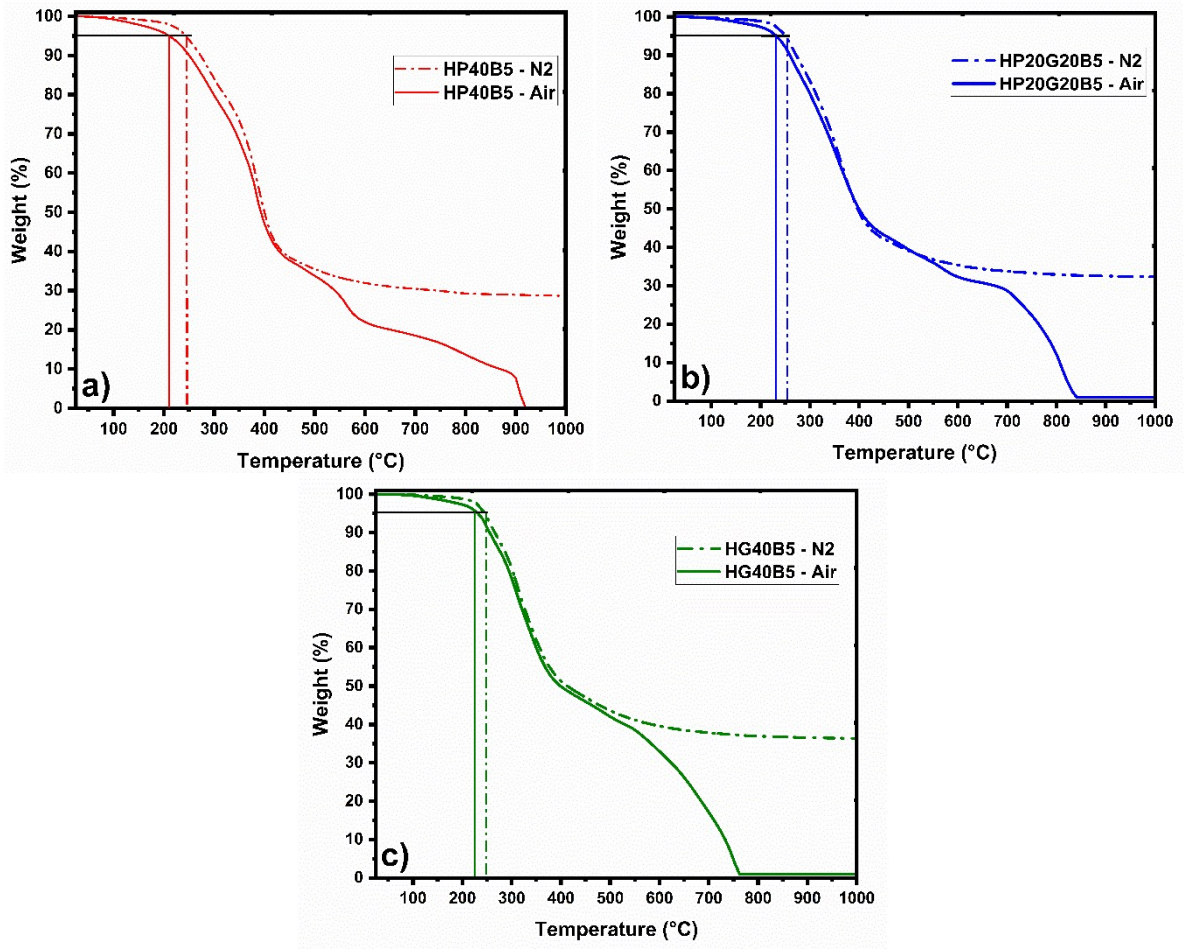

Figure S5. Weight ratio vs temperature for the non-isothermal degradation of humins based resins conducted under inert (dash line) and oxidative atmosphere (solid line)

Tale S5. TGA degradation steps of the materials

Resins	1st degradation		2nd degradation		3rd degradation	
	T_{max} peak (°C)	Mass loss (%)	T_{max} peak (°C)	Mass loss (%)	T_{max} peak (°C)	Mass loss (%)
HP40B5	379	63	566	20	910	17
HP20G20B5	359	57	566	13	812	30
HG40B5	310	55	498	14	753	31