Improving the Hydrolytic Stability of Aryl Cyanate Esters by Examining the Effects of Extreme Environments on Polycyanurate Copolymers

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Fig. S1. Images of selected blends between *1-3*.

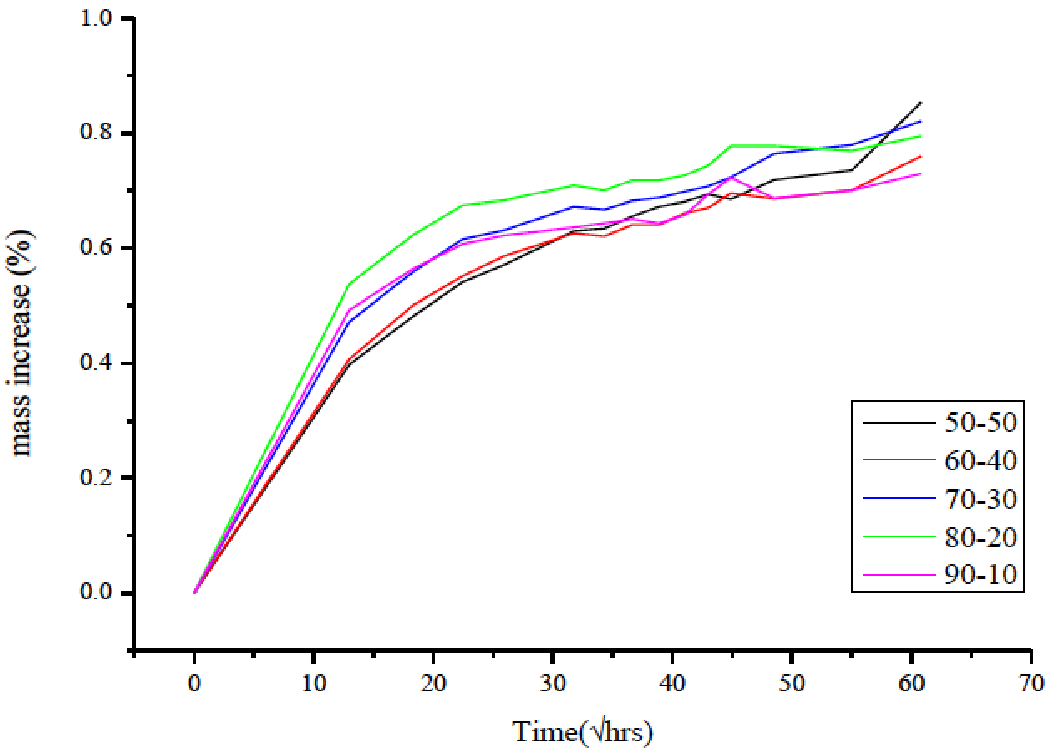


Fig. S2. *[1ₓ-2ᵧ]* H_2O absorbed (%) *vs.* time (√hrs) at 75 % RH

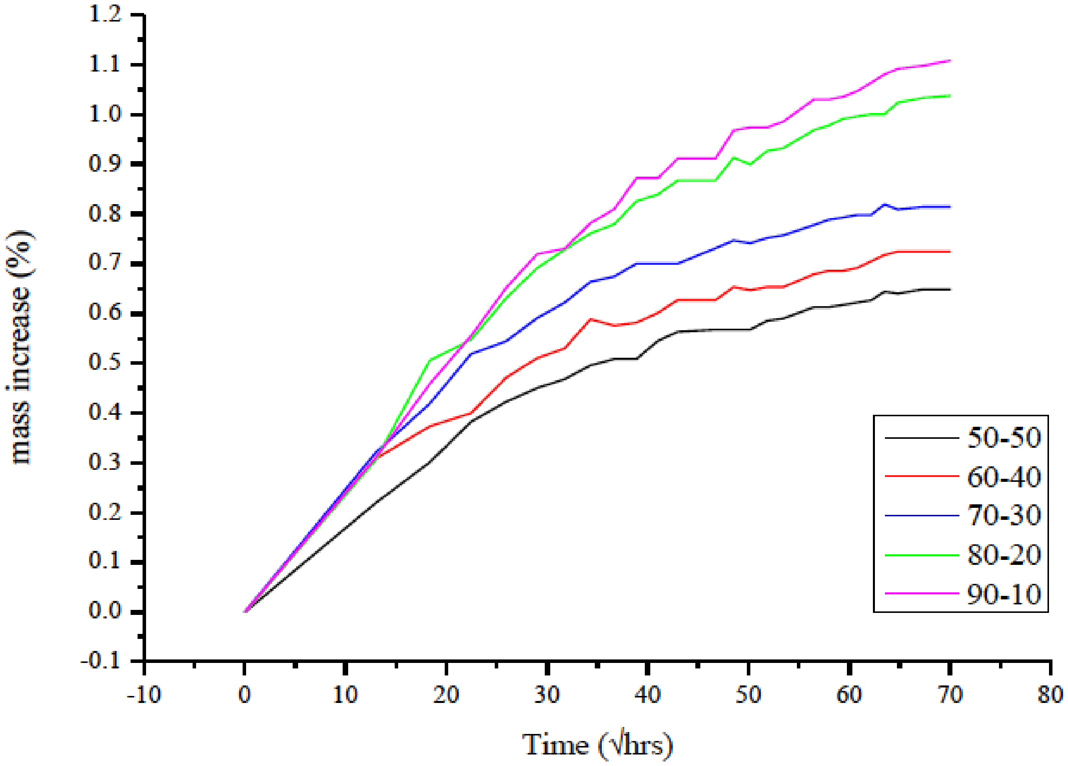


Fig. S3. *[3_x-1_y]* **H_2O absorbed (%) *vs.* time (√hrs) at 75 % RH**

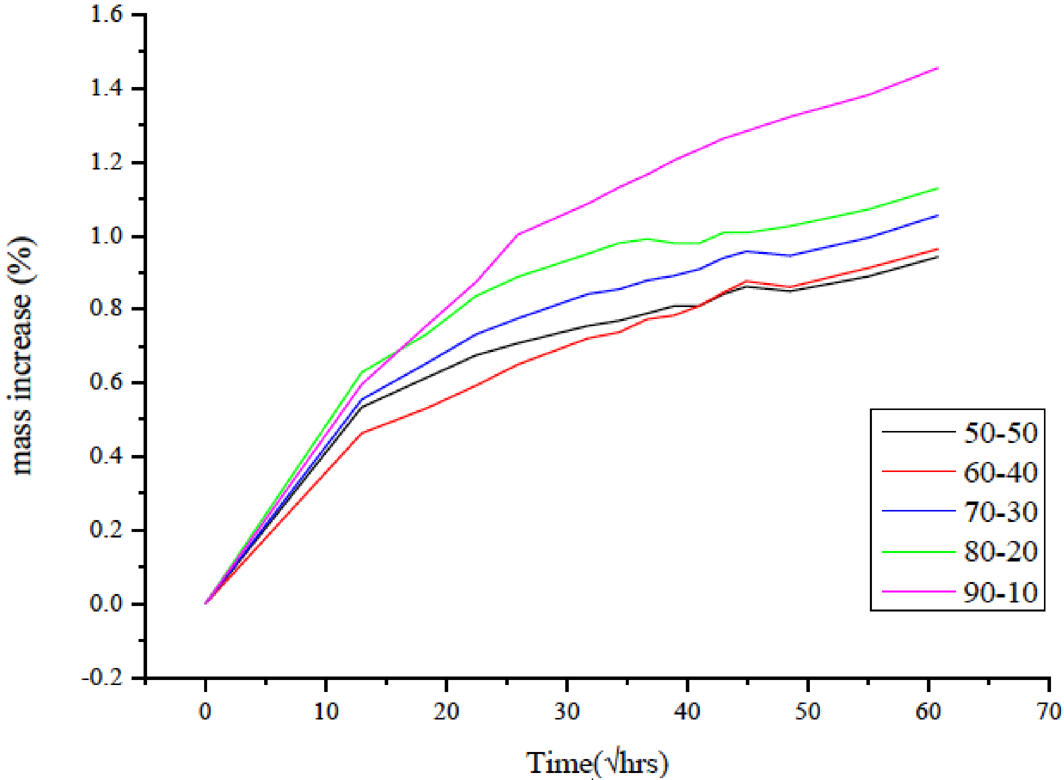


Fig. S4. *[3_x-2_y]* **H_2O absorbed (%) *vs.* time (√hrs) at 75 % RH**

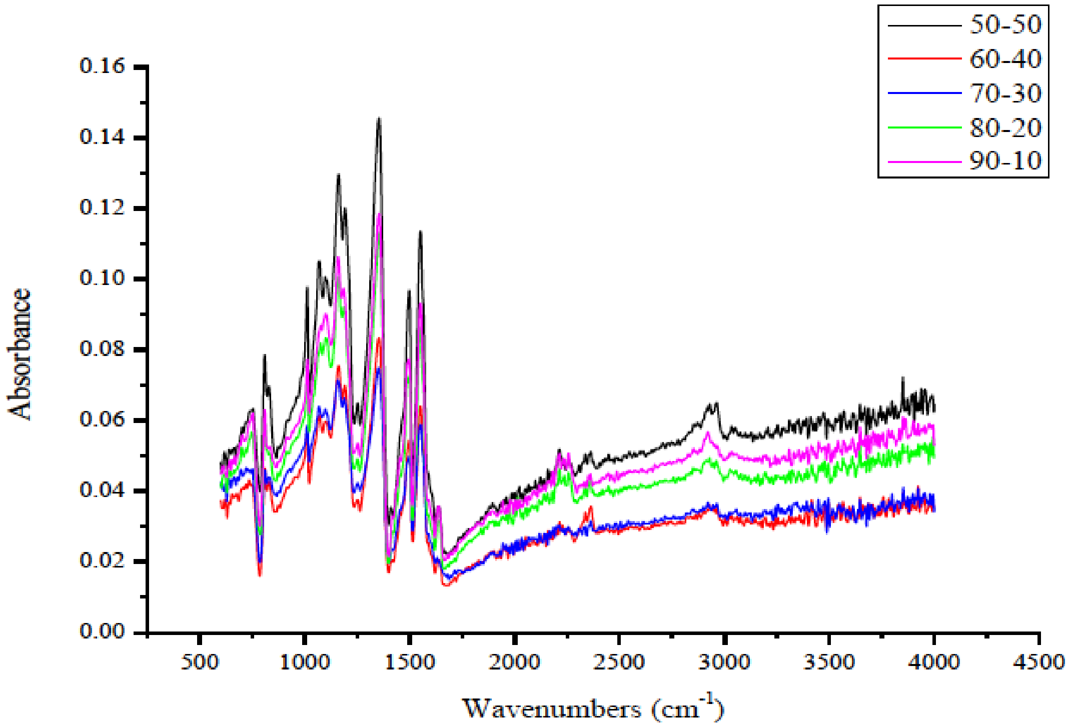


Fig. S5. Spectral analysis of ***[3$_x$-1$_y$]***

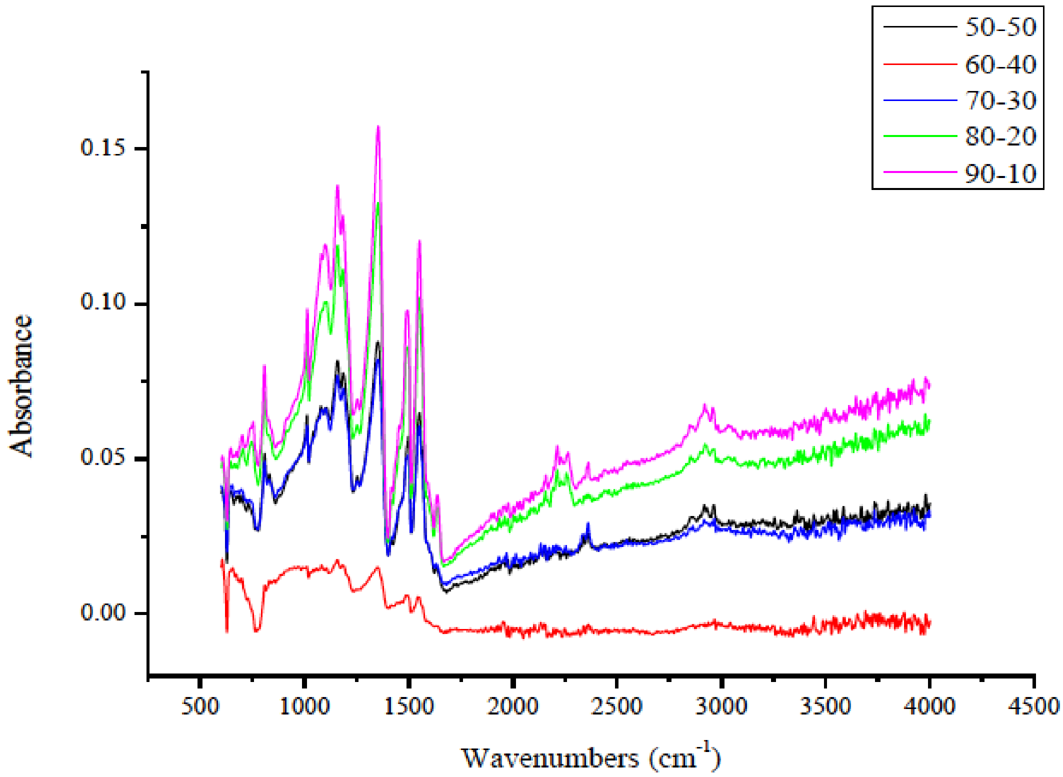


Fig. S6. Spectral analysis of ***[3$_x$-2$_y$]***

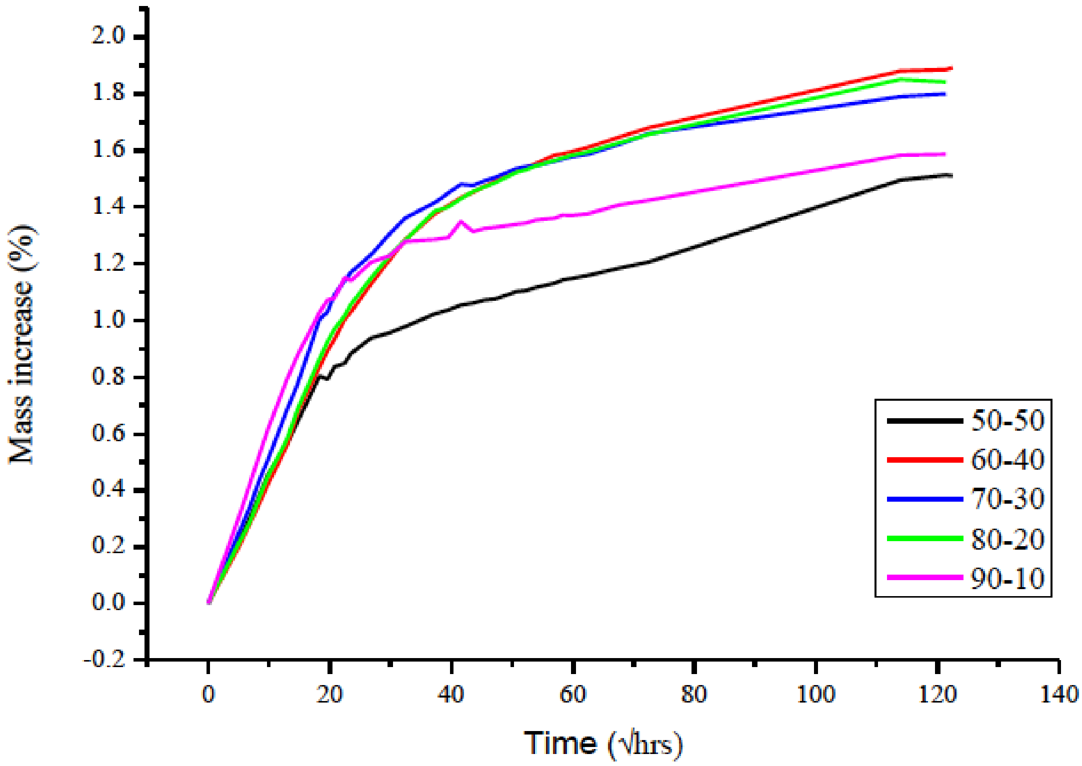


Fig. S7. ***[1_x-2_y]*** **H_2O absorbed (%)** ***vs.*** **time (√hrs)**

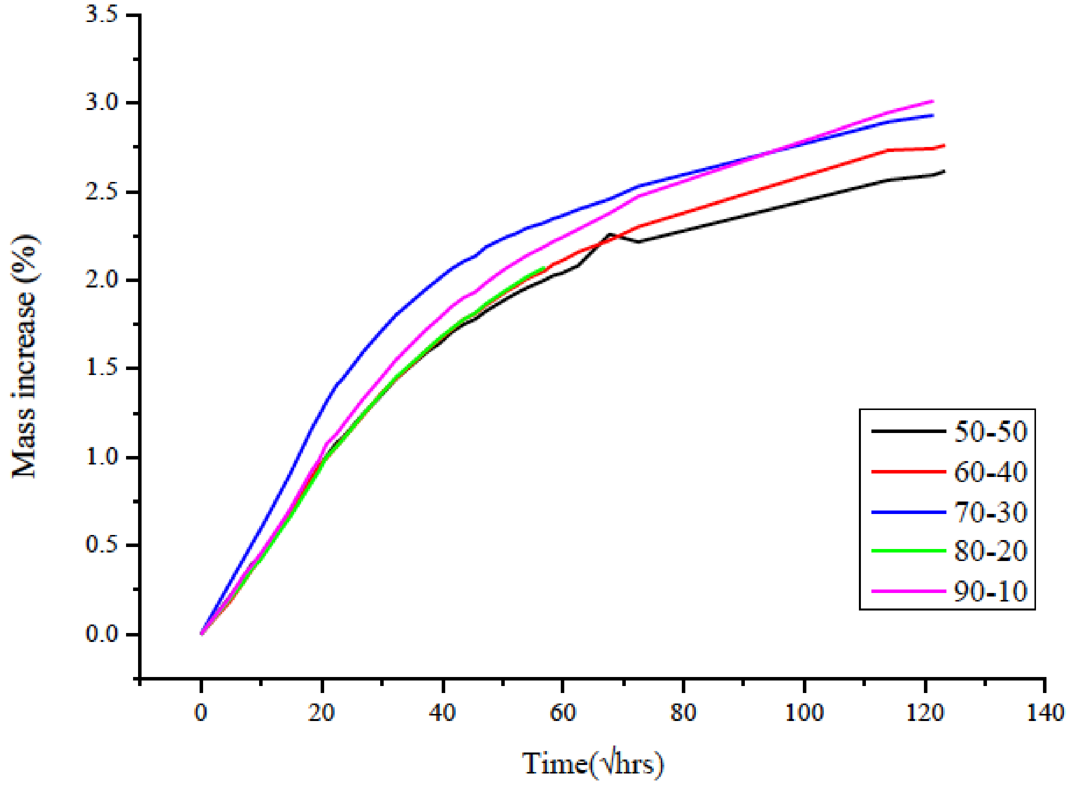


Fig. S8. *[3_x-1_y]* **H_2O absorbed (%)** ***vs.*** **time (√hrs)**

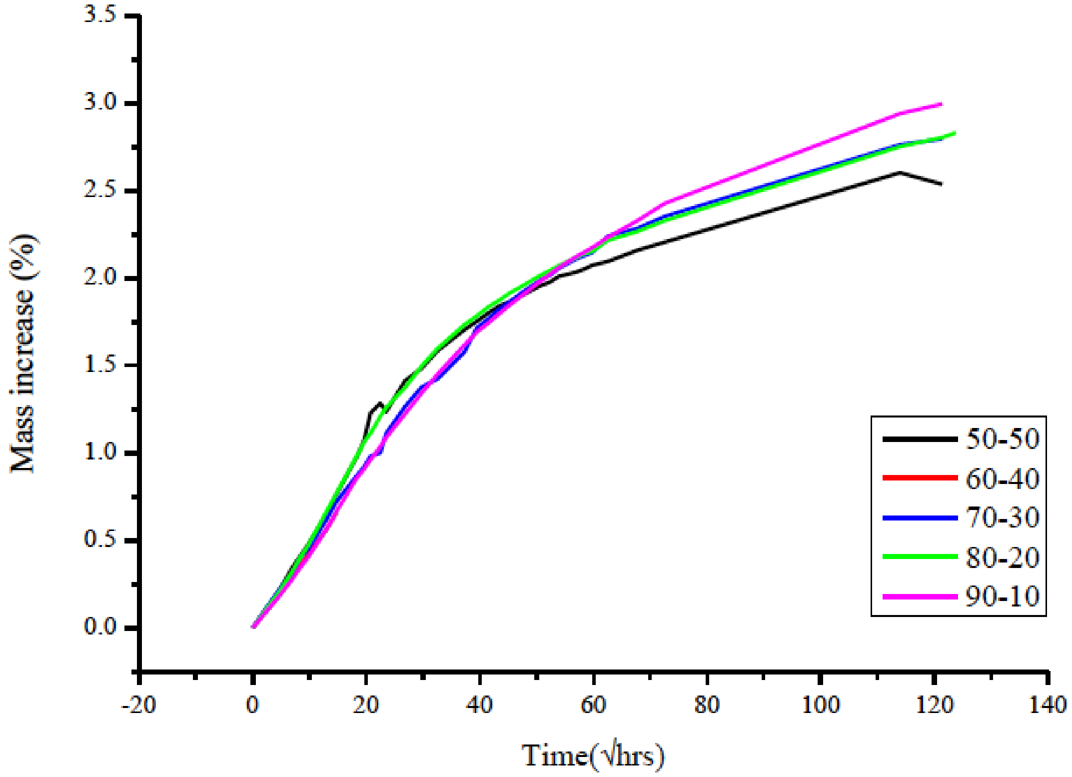


Fig. S9. *[3_x-2_y]* **H_2O absorbed (%)** ***vs.*** **time (√hrs)**

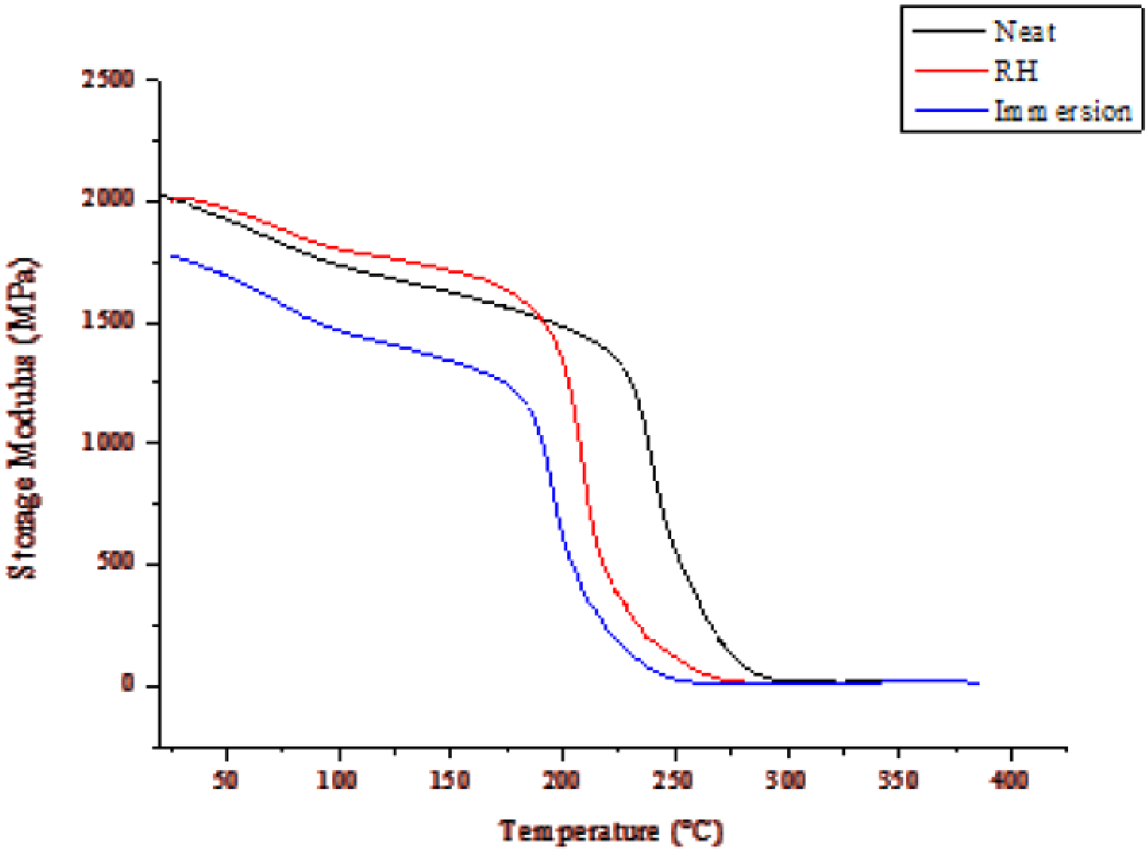
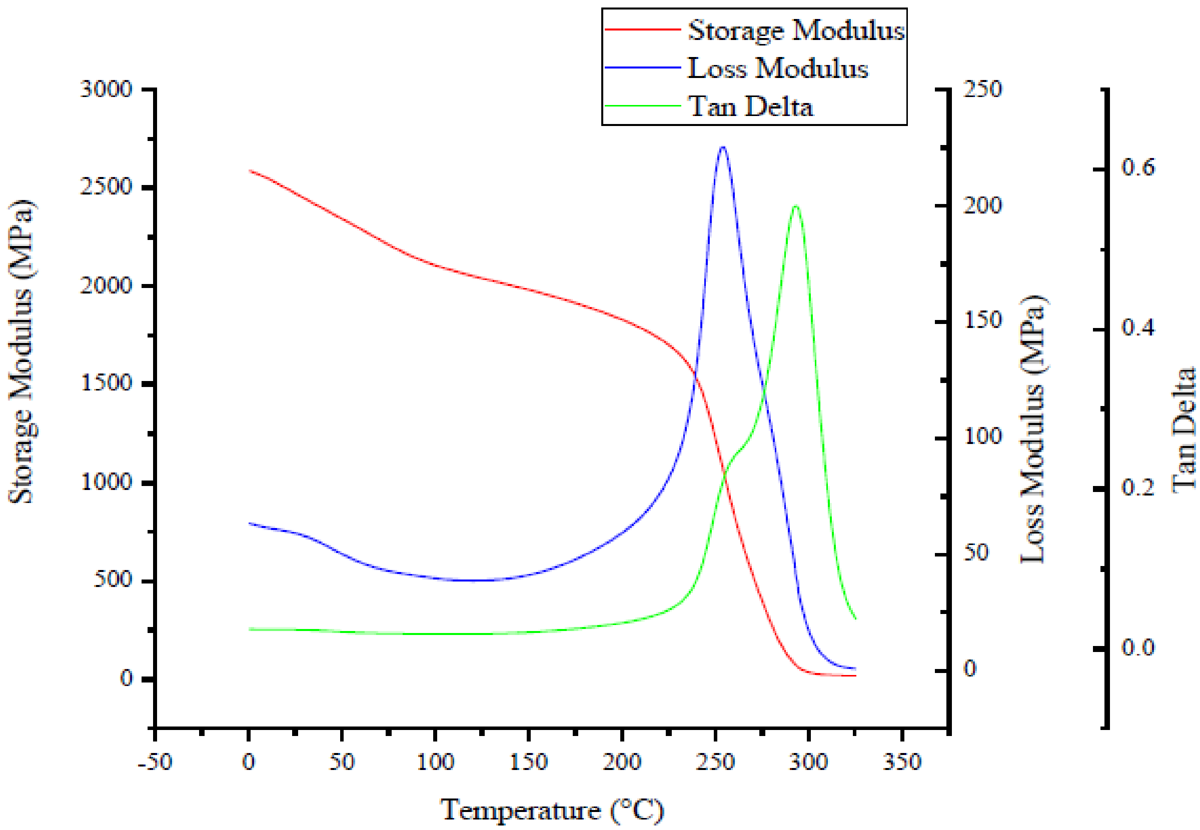


Fig. S10. DMTA data for unexposed (black), RH (red) and immersion (blue) for the blend [*1*$_{50}$-*2*$_{50}$] showing storage modulus as a function of temperature.



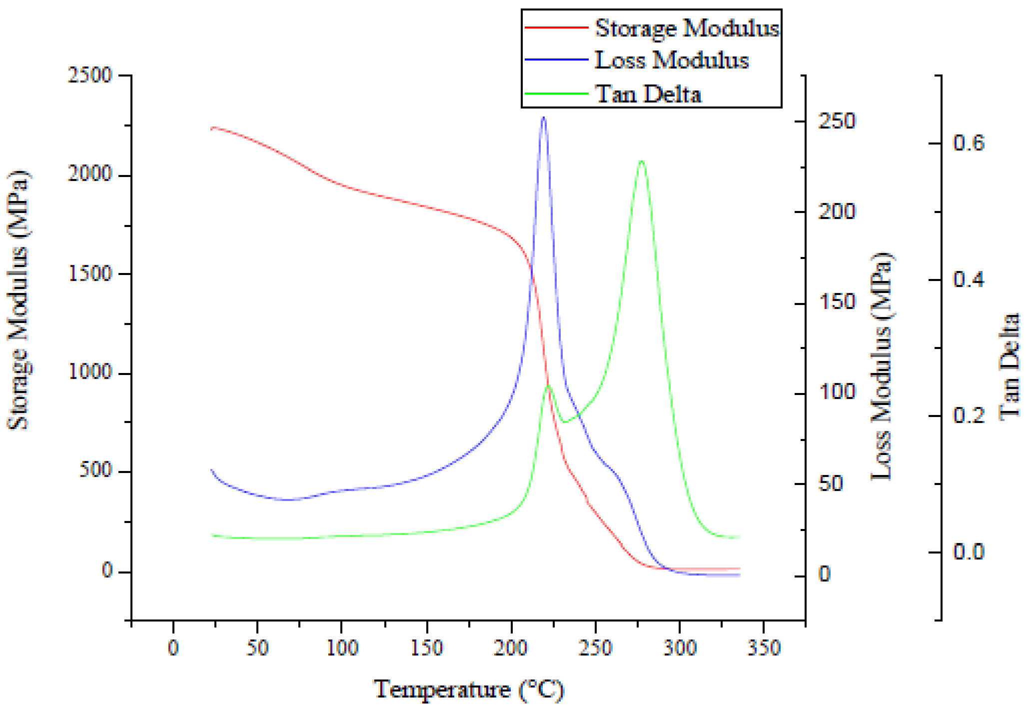


Fig. S11 DMTA data for *1_{70}-2_{30}* (top) and [*1_{70}-2_{30}*] (bottom) showing storage and loss moduli as a function of temperature.

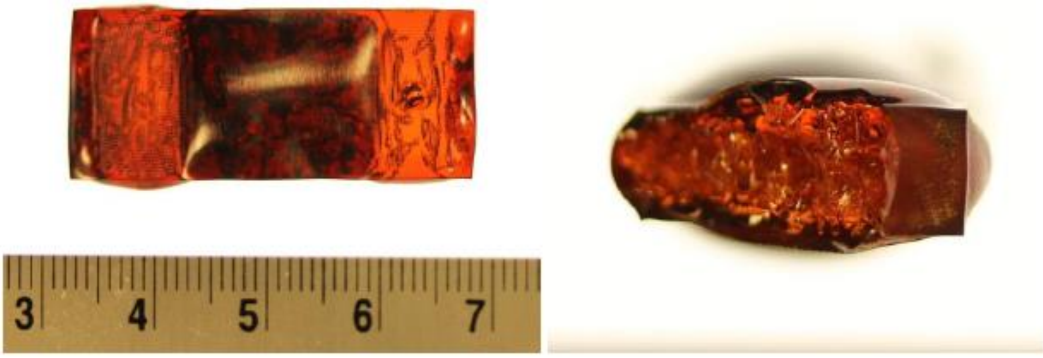


Fig. S12 High resolution images of outgassing in [$(1)_{50}$-$(2)_{50}$]

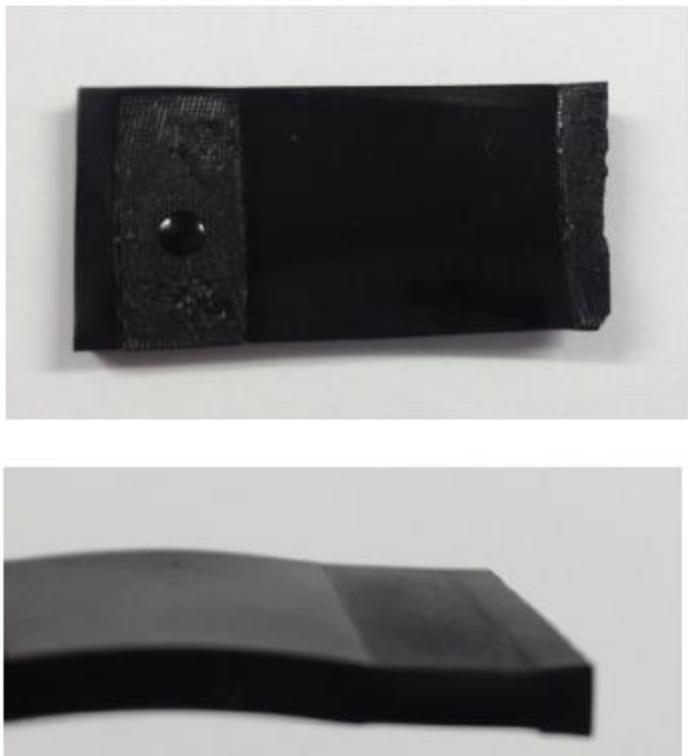


Fig. S13 Top view (above) and side view (below) of [$(3)_{90}$-$(2)_{10}$] following exposure and DMTA.

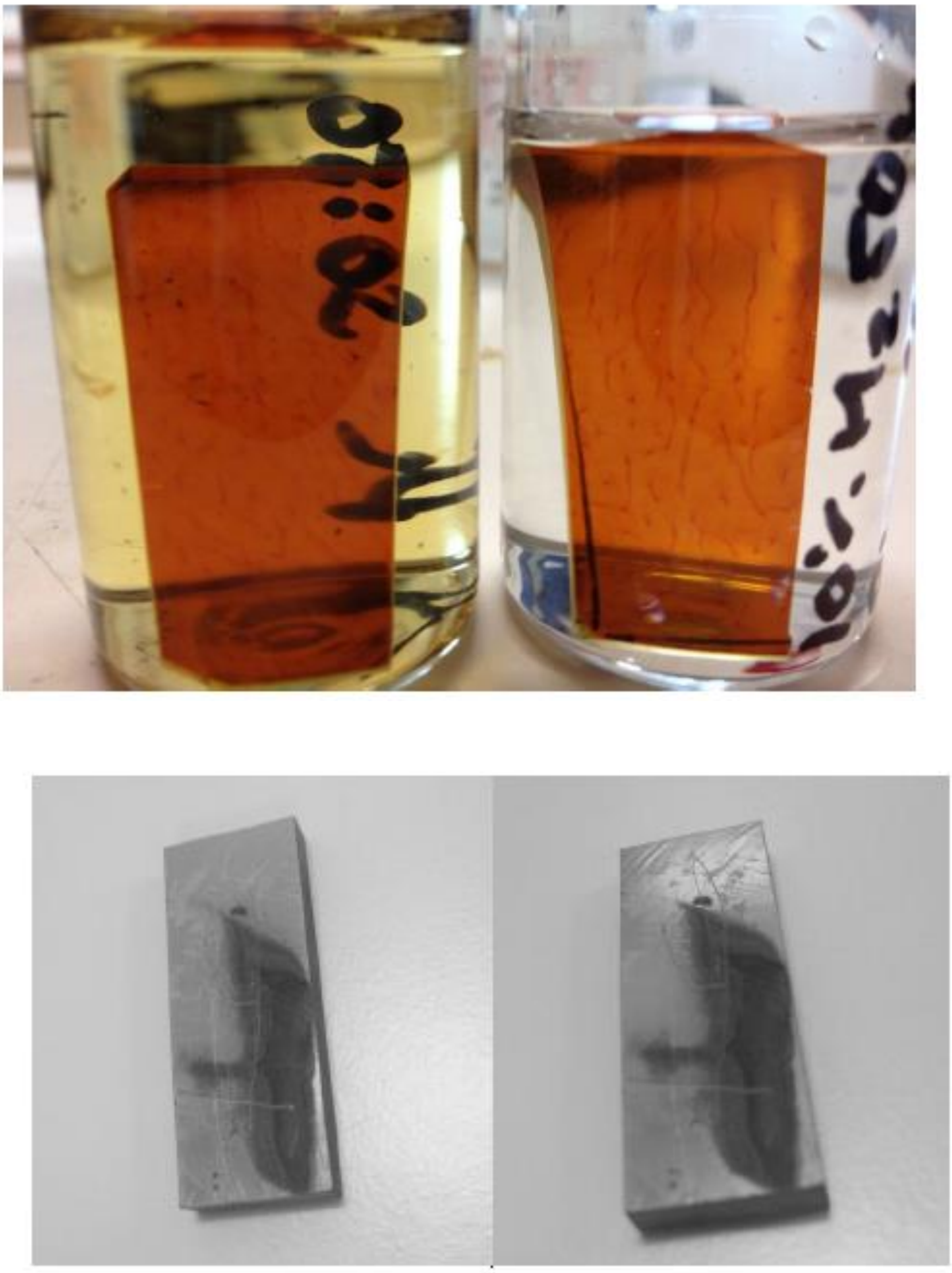


Fig. S14 Basic (left) and Acidic (right) environments with immersed [(3)$_{80}$-(2)$_{20}$] (top), surface etching of [(3)$_{80}$-(2)$_{20}$] (bottom) following exposure to NaOH for 3192 hours.

Table S1. Mass uptakes observed in 75.3 % RH studies

Material	Initial mass (M_0)/g	Final mass (M_i)/g	H_2O absorption/%
$\boldsymbol{1}_{50}$-$\boldsymbol{2}_{50}$	2.3344	2.3545	0.85
$\boldsymbol{1}_{60}$-$\boldsymbol{2}_{40}$	1.9844	1.9996	0.76
$\boldsymbol{1}_{70}$-$\boldsymbol{2}_{30}$	1.9211	1.9370	0.82
$\boldsymbol{1}_{80}$-$\boldsymbol{2}_{20}$	1.1480	1.1572	0.80
$\boldsymbol{1}_{90}$-$\boldsymbol{2}_{10}$	1.3742	1.3843	0.73
$\boldsymbol{3}_{50}$-$\boldsymbol{1}_{50}$	2.1897	2.2040	0.65
$\boldsymbol{3}_{60}$-$\boldsymbol{1}_{40}$	1.5209	1.5320	0.72
$\boldsymbol{3}_{70}$-$\boldsymbol{1}_{30}$	1.9007	1.9163	0.81
$\boldsymbol{3}_{80}$-$\boldsymbol{1}_{20}$	2.1262	2.1485	1.04
$\boldsymbol{3}_{90}$-$\boldsymbol{1}_{10}$	1.7388	1.7583	1.11
$\boldsymbol{3}_{50}$-$\boldsymbol{2}_{50}$	1.4718	1.4858	0.94
$\boldsymbol{3}_{60}$ -$\boldsymbol{2}_{40}$	1.9115	1.9301	0.96
$\boldsymbol{3}_{70}$-$\boldsymbol{2}_{30}$	1.6132	1.6304	1.06
$\boldsymbol{3}_{80}$-$\boldsymbol{2}_{20}$	1.7078	1.7273	1.13
$\boldsymbol{3}_{90}$-$\boldsymbol{2}_{10}$	1.9839	2.0132	1.46

Table S2. Mass uptake observed in direct immersion studies

Material	Initial mass (M_0) /g	Final mass (M_i) /g	H_2O absorption/ %
1$_{50}$-***2***$_{50}$	8.9461	9.0833	1.51
1$_{60}$-***2***$_{40}$	13.5747	13.8366	1.89
1$_{70}$-***2***$_{30}$	10.6314	10.827	1.81
1$_{80}$-***2***$_{20}$	12.9197	13.1641	1.86
1$_{90}$-***2***$_{10}$	7.5177	7.6385	1.58
3$_{50}$-***1***$_{50}$	17.2649	17.7285	2.61
3$_{60}$-***1***$_{40}$	17.3742	17.8680	2.76
3$_{70}$-***1***$_{30}$	12.7562	13.1457	2.96
3$_{80}$-***1***$_{20}$	15.4618	15.9268	2.92
3$_{90}$-***1***$_{10}$	13.8261	14.2588	3.03
3$_{50}$-***2***$_{50}$	13.5108	13.8650	2.55
3$_{60}$ -***2***$_{40}$	17.2138	17.6260	2.34
3$_{70}$-***2***$_{30}$	15.4747	15.9267	2.84
3$_{80}$-***2***$_{20}$	11.8710	12.2167	2.83
3$_{90}$-***2***$_{10}$	15.6982	16.1960	3.07

Table S3. Thermogravimetric data for cured binary cyanate ester blends as determined by TGA (nitrogen, 10 K/minute)

Sample	Mass Loss at Temperature (°C)							Y_C (%)
	5 %	10 %	20 %	30 %	40 %	50 %	60 %	
1	413	423	428	435	458	538	575	1.83
2	417	422	430	452	530	571	588	1.89
3	423	434	522	595	620	635	650	1.76
$\mathbf{1}_{50}$-$\mathbf{2}_{50}$	414	422	427	436	484	549	576	2.03
$\mathbf{1}_{60}$-$\mathbf{2}_{40}$	411	419	421	422	429	470	551	1.54
$\mathbf{1}_{70}$-$\mathbf{2}_{30}$	416	425	427	436	470	542	570	1.45
$\mathbf{1}_{80}$-$\mathbf{2}_{20}$	413	425	430	438	489	552	579	1.22
$\mathbf{1}_{90}$-$\mathbf{2}_{10}$	410	424	428	435	458	530	552	1.76
$\mathbf{1}_{30}$-$\mathbf{2}_{50}$	416	425	441	522	572	595	608	138
$\mathbf{1}_{60}$-$\mathbf{2}_{40}$	419	426	460	552	592	610	622	1.59
$\mathbf{3}_{70}$-$\mathbf{1}_{30}$	420	429	498	573	604	621	635	1.65
$\mathbf{3}_{80}$-$\mathbf{1}_{20}$	420	431	498	578	609	625	640	1.33
$\mathbf{3}_{90}$-$\mathbf{1}_{10}$	419	434	515	585	603	619	633	1.67
$\mathbf{3}_{50}$-$\mathbf{2}_{50}$	420	430	484	558	592	608	621	1.41
$\mathbf{3}_{60}$-$\mathbf{2}_{40}$	420	432	489	560	594	612	624	1.75
$\mathbf{3}_{70}$-$\mathbf{2}_{30}$	408	423	429	487	555	587	604	1.47
$\mathbf{3}_{80}$-$\mathbf{2}_{20}$	420	434	513	574	603	619	633	1.58
$\mathbf{3}_{90}$-$\mathbf{2}_{10}$	418	433	508	566	597	614	628	1.34

Y_C = Char yield measured at 800 °C

Table S4. Mass uptakes observed in acid/base studies

Material	Initial mass (M_0) /g		Final mass (M_i) /g		Mass change /%	
	H_2SO_4	NaOH	H_2SO_4	NaOH	H_2SO_4	NaOH
1$_{50}$-***2***$_{50}$	2.086	2.208	2.1097	2.2348	+1.01	+1.01
1$_{60}$-***2***$_{40}$	1.672	1.449	1.6915	1.4670	+1.01	+1.01
1$_{70}$-***2***$_{30}$	2.289	2.363	2.1350	2.3897	+1.01	+1.01
1$_{80}$-***2***$_{20}$	1.892	1.768	1.9118	1.7904	+1.01	+1.02
1$_{90}$-***2***$_{10}$	0.641	0.481	0.6460	0.4865	+1.01	+1.01
3$_{50}$-***1***$_{50}$	1.776	1.750	1.7950	1.7700	+1.01	+1.01
3$_{60}$-***1***$_{40}$	1.816	2.370	1.8365	2.4016	+1.01	+1.01
3$_{70}$-***1***$_{30}$	2.217	1.458	2.2395	1.4773	+1.01	+1.01
3$_{80}$-***1***$_{20}$	1.909	2.427	1.9307	2.4620	+1.01	+1.01
3$_{90}$-***1***$_{10}$	1.720	1.889	1.7388	1.9242	+1.01	+1.02
3$_{50}$-***2***$_{50}$	1.254	1.327	1.2648	1.3380	+1.01	+1.01
3$_{60}$ -***2***$_{40}$	1.335	0.970	1.3462	0.9810	+1.01	+1.01
3$_{70}$-***2***$_{30}$	1.930	2.052	1.946	2.0761	+1.01	+1.01
3$_{80}$-***2***$_{20}$	1.703	1.671	1.7265	1.6909	+1.01	+1.01
3$_{90}$-***2***$_{10}$	1.523	1.398	1.5408	1.4282	+1.01	+1.02