

## Supporting Information

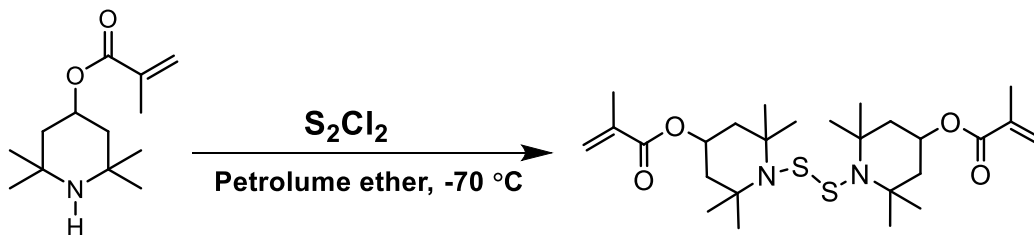
### **Reprocessable covalent adaptable networks with excellent elevated-temperature creep resistance: Facilitation by dynamic, dissociative bis(hindered amino) disulfide bonds**

Mohammed A. Bin Rusayyis<sup>a</sup>, and John M. Torkelson<sup>\*,a,b</sup>

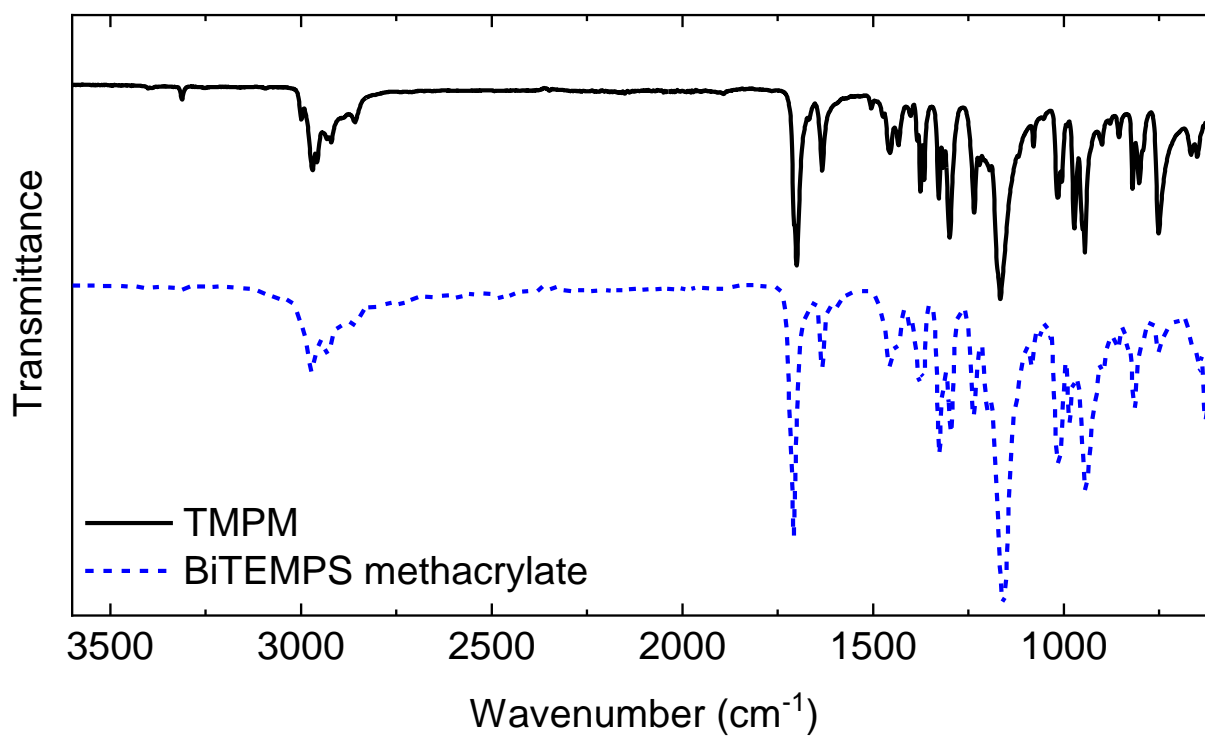
<sup>a</sup> Dept. of Materials Science and Engineering, Northwestern University, Evanston, IL 60208, USA

<sup>b</sup> Dept. of Chemical and Biological Engineering, Northwestern University, Evanston, IL 60208, USA

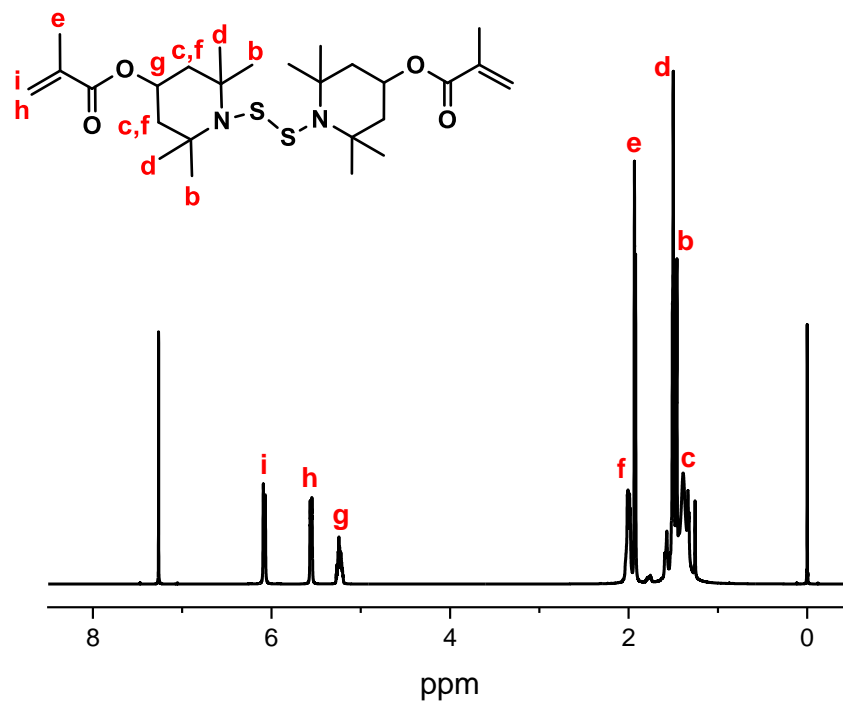
\*Corresponding author. Email address: j-torkelson@northwestern.edu



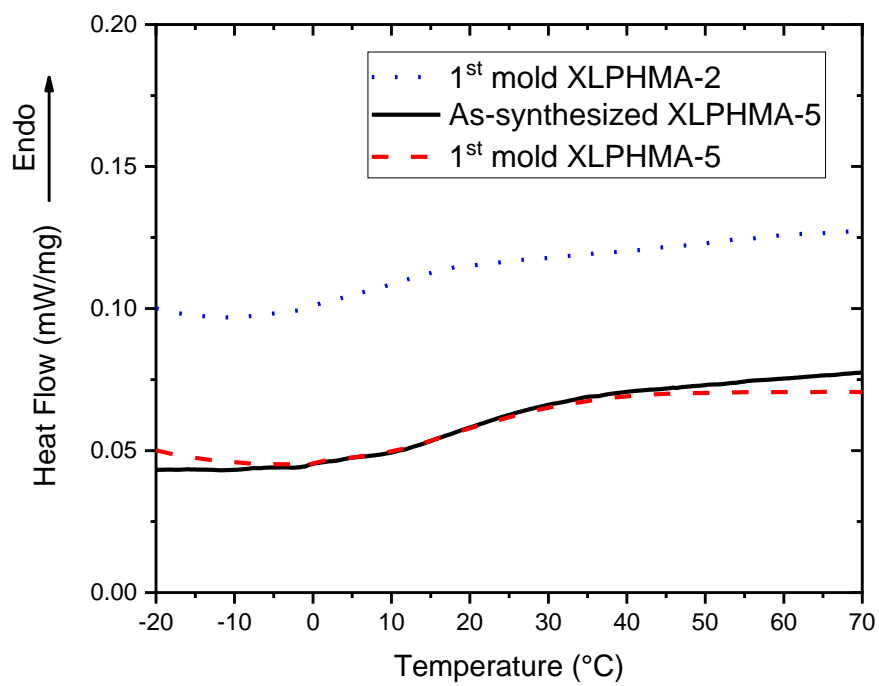
**Scheme S1.** Synthesis of BiTEMPS methacrylate.



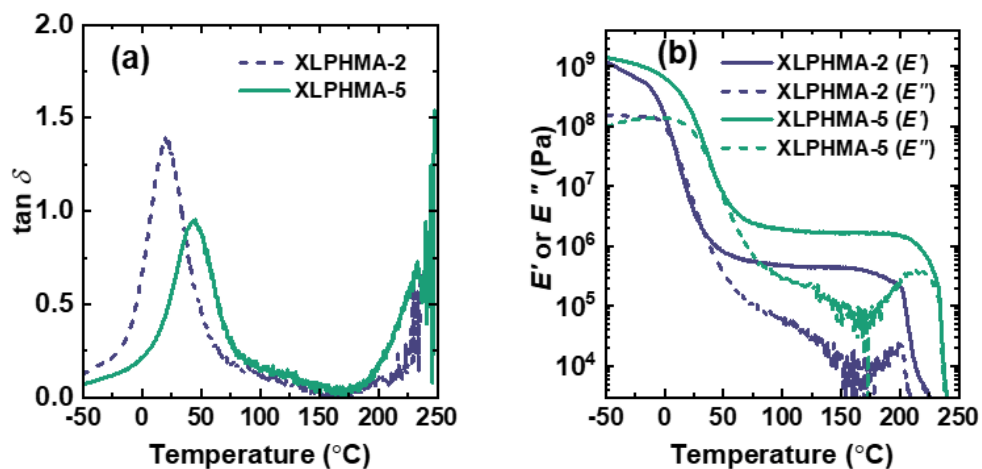
**Figure S1.** FTIR Spectra of TPM and BiTEMPS methacrylate.



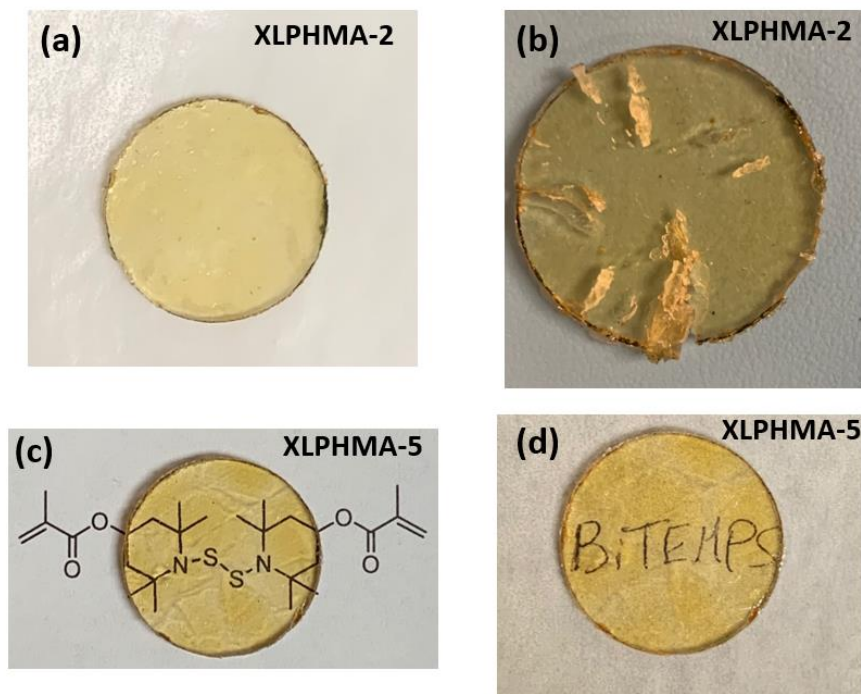
**Figure S2.** <sup>1</sup>H NMR spectrum of BiTEMPS methacrylate.



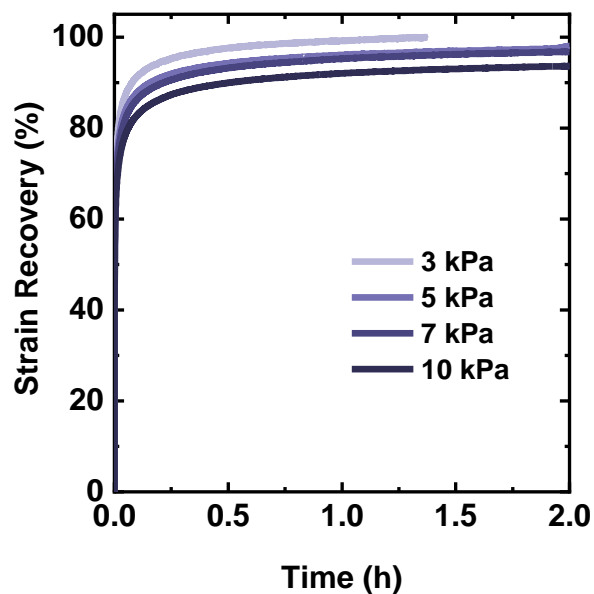
**Figure S3.** Heat flow curves of as-synthesized and molded network samples.



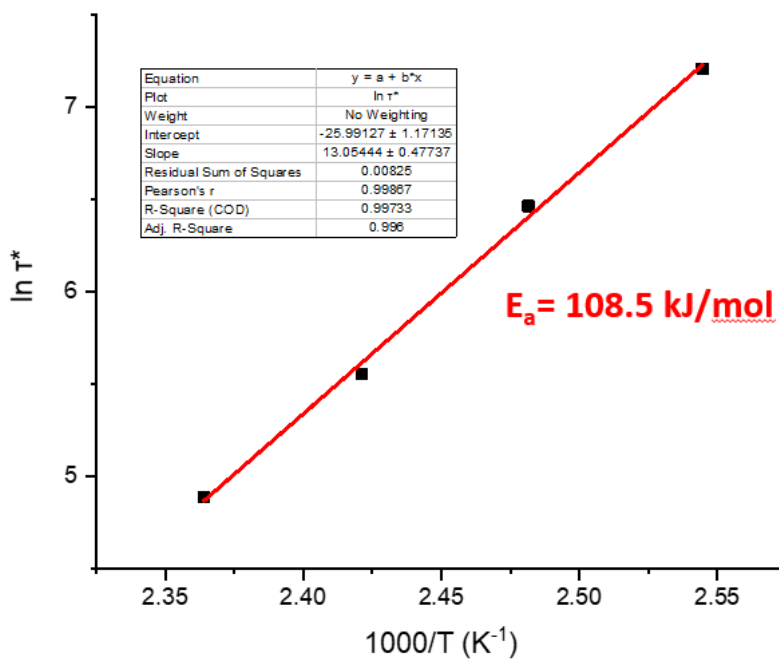
**Figure S4.** (a) Damping ratio ( $\tan \delta = E''/E'$ ) and (b) tensile storage modulus ( $E'$ ) and loss modulus ( $E''$ ) of 1<sup>st</sup> mold XLPHMA-2 and XLPHMA-5 networks.



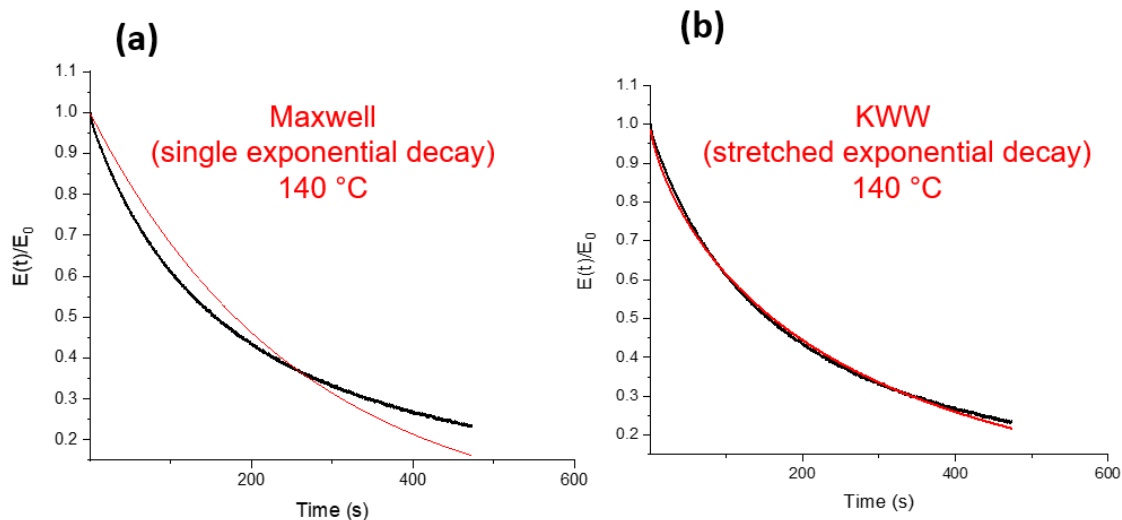
**Figure S5.** Pictures of XLPHMA-2 sample (a) before and (b) after the creep test and XLPHMA-5 sample (c) before and (d) after the 3-kPa creep test at 70 °C.



**Figure S6.** Strain recovery as a function of time for the XLPHMA-5 network at 70 °C after 13.9 h of creep testing under different stresses.



**Figure S7.** Fitting of characteristic relaxation times determined from Maxwell model to the Arrhenius equation.



**Figure S8.** Fitting of stress relaxation data of the XLPHMA-5 network at 140 °C to (a) the Maxwell model and (b) KWW function.

**Table S1.** Swelling ratio and gel content of as-synthesized and molded poly(hexyl methacrylate) networks.

Sample	XLPHMA-2		XLPHMA-5	
	Swelling Ratio (%)	Gel content (%)	Swelling Ratio (%)	Gel content (%)
<b>As-synthesized</b>	476 ± 8	89.6 ± 0.9	286 ± 7	96.9 ± 0.6
<b>1st mold</b>	382 ± 5	94.3 ± 0.7	187 ± 16	98.8 ± 0.6
<b>2nd mold</b>	-	-	183 ± 17	99.3 ± 0.4
<b>3rd mold</b>	-	-	189 ± 12	98.9 ± 0.9

**Table S2.**  $E'$  value of 1<sup>st</sup> mold XLPHMA-2 and XLPHMA-5 networks as a function of temperature.

Sample	Mold	$E'$ (MPa)										
		70 °C	80 °C	90 °C	100 °C	110 °C	120 °C	130 °C	140 °C	150 °C	160 °C	170 °C
XLPHMA-2	1 <sup>st</sup> mold	0.56	0.53	0.5	0.47	0.46	0.45	0.44	0.45	0.44	0.42	0.39
XLPHMA-5	1 <sup>st</sup> mold	2.66	2.22	2.04	1.93	1.79	1.70	1.69	1.65	1.64	1.67	1.66