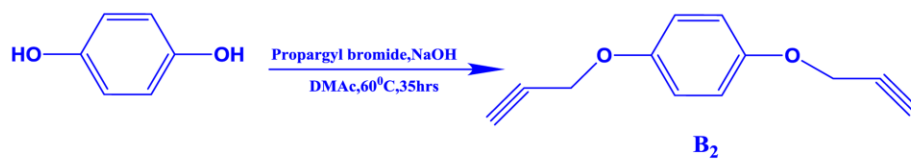
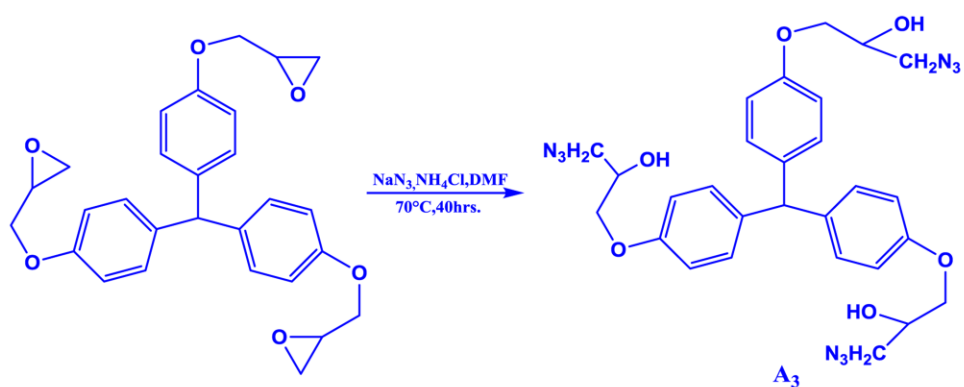
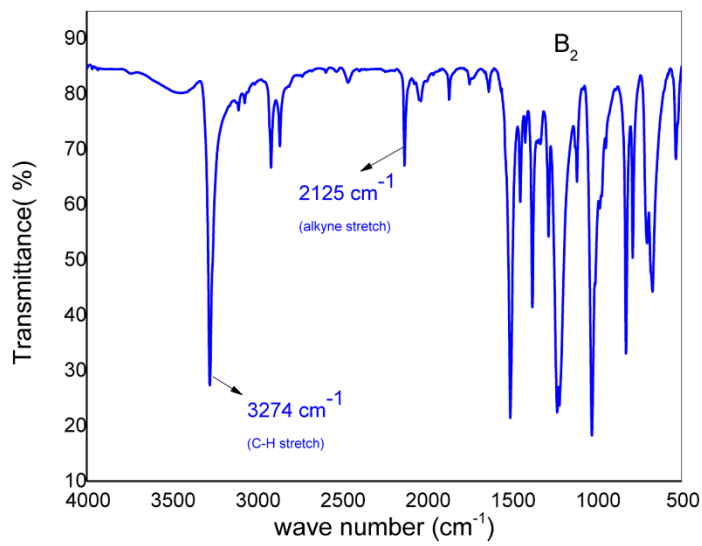
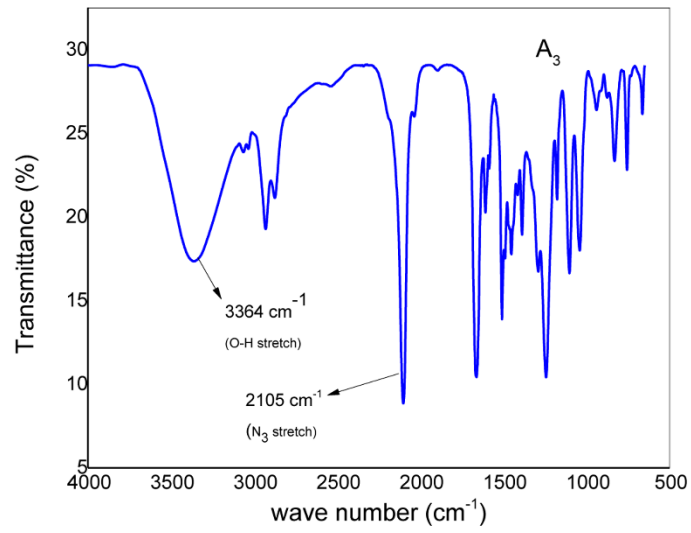


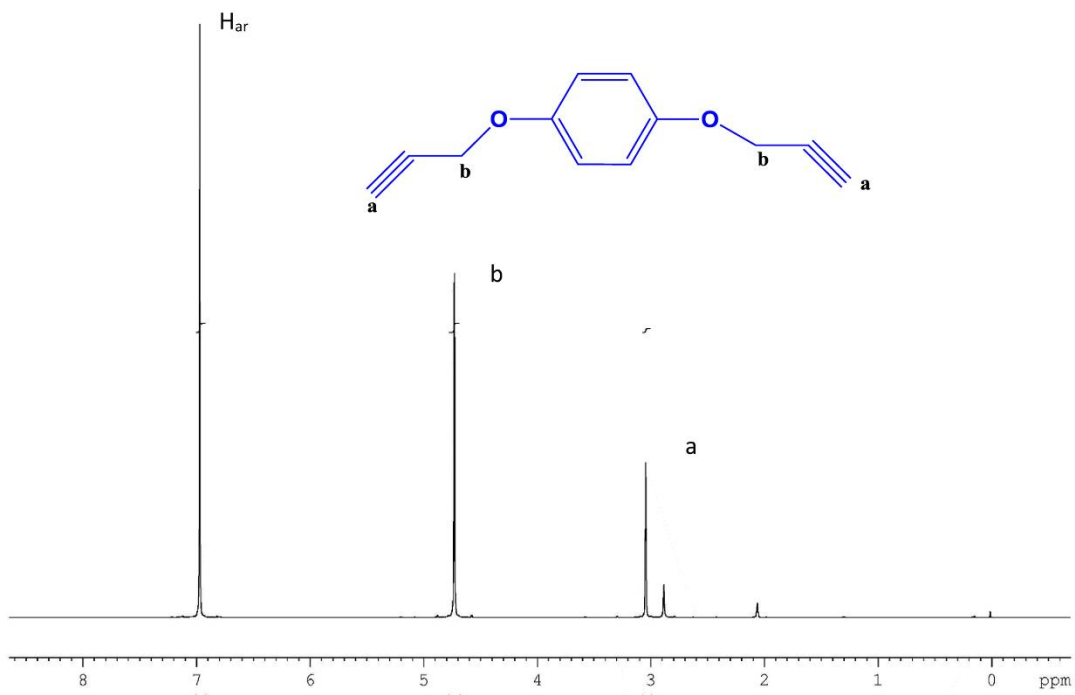
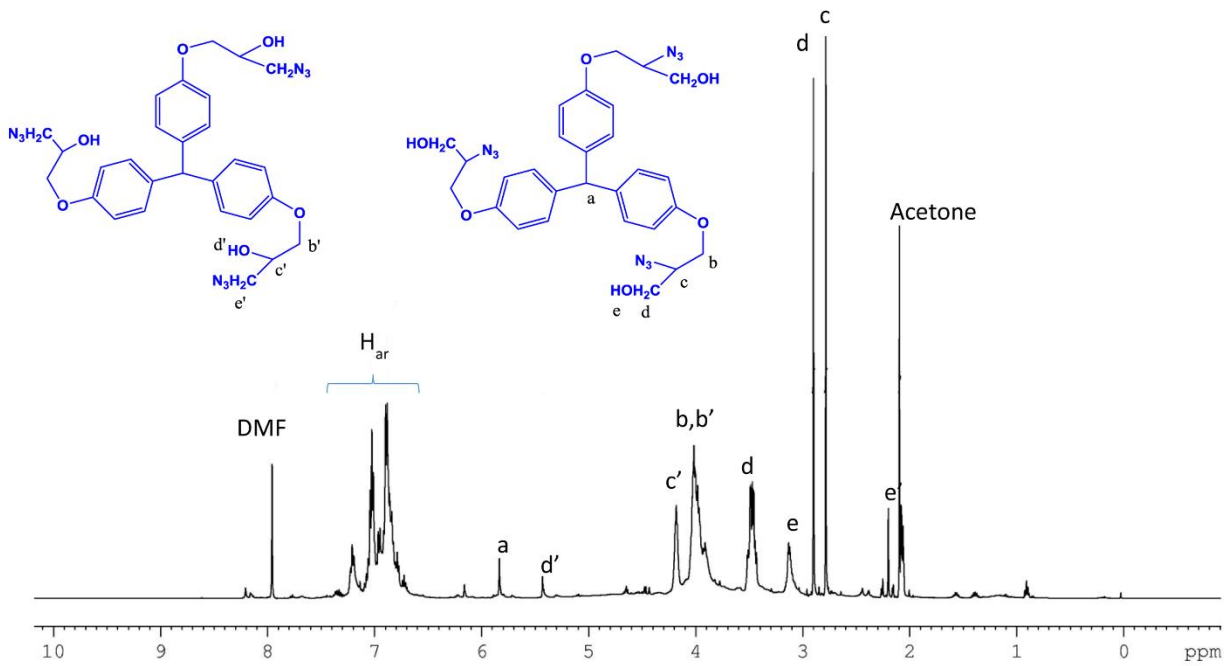
## Supporting Information



**SI 1** Synthesis of trisazide of tris (4-hydroxyphenyl) triglycidylether methane and propargylation of quinol and novolac oligomer.



**SI2a**



SI2b

**Characterization of propargyl novolac (B<sub>3</sub>):** FTIR (KBr, cm<sup>-1</sup>): 3288 (propargyl –CH), 2100 (propargyl), 3424 (-OH). Proton NMR (ppm, CDCl<sub>3</sub>): δ = 7.18 (m, Ar), 6.94 (m, Ar), 4.6-4.9 (-OCH<sub>2</sub>), 3.45 (propargyl –CH). Extent of propargylation was estimated from hydroxyl value of the resin after reaction. OH<sub>initial</sub> = 500 mg KOH/g; OH<sub>after functionalization</sub> = 62 mg KOH/g. Extent of propargylation = 85 %. Molecular weight of oligomer ~ 600 g/mol (inherent viscosity = 0.04 dL/g).

### SI2c

**SI 2 a)** FTIR spectra of A<sub>3</sub> and B<sub>2</sub> monomers **b)** Proton NMR spectra of A<sub>3</sub> and B<sub>2</sub> monomers **c)** Characterization of propargyl novolac (B<sub>3</sub>)

**SI 3** Calculation of swell ratio (Q) of SMPs

$$Q = 1 + (\rho_1 / \rho_2) [(W_d / W_s) - 1]$$

Where

Q = swell ratio

W<sub>d</sub> = Weight of dry sample

W<sub>s</sub> = Weight of swollen sample

ρ<sub>1</sub> = Specific density of the swelling medium (= 0.86 g/cm<sup>3</sup> for toluene)

ρ<sub>2</sub> = Specific density of the polymer (taken as 1.20 g/cm<sup>3</sup>)

**SI 4** Calculation of cross-link density of SMPs

According to theory of rubber elasticity, cross-link density of moderately cross-linked polymers can be calculated using the equation

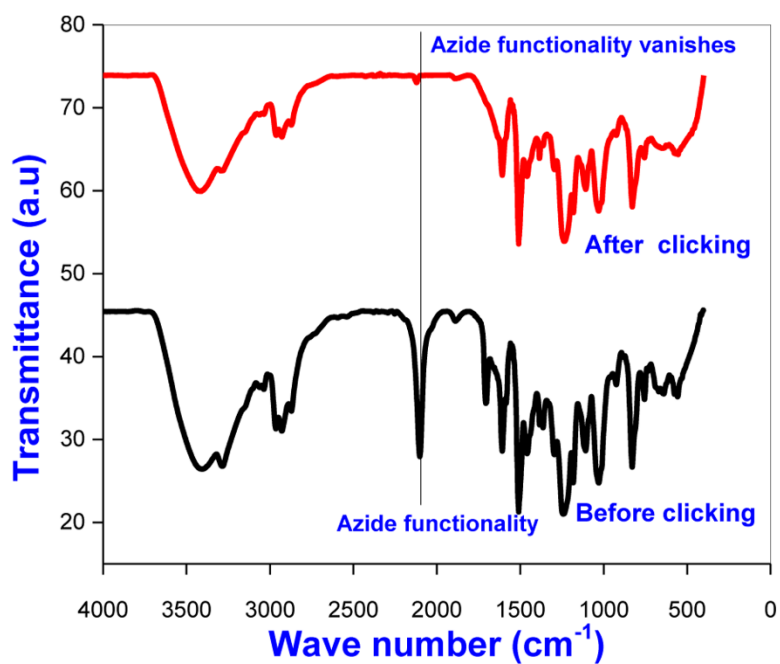
$$X_{\text{density}} = G/RT$$

X<sub>density</sub> = Cross-link density in moles/m<sup>3</sup>

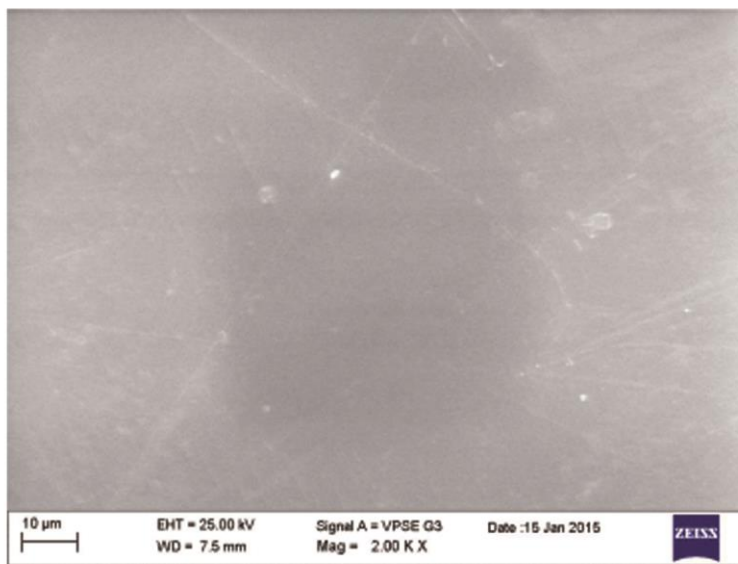
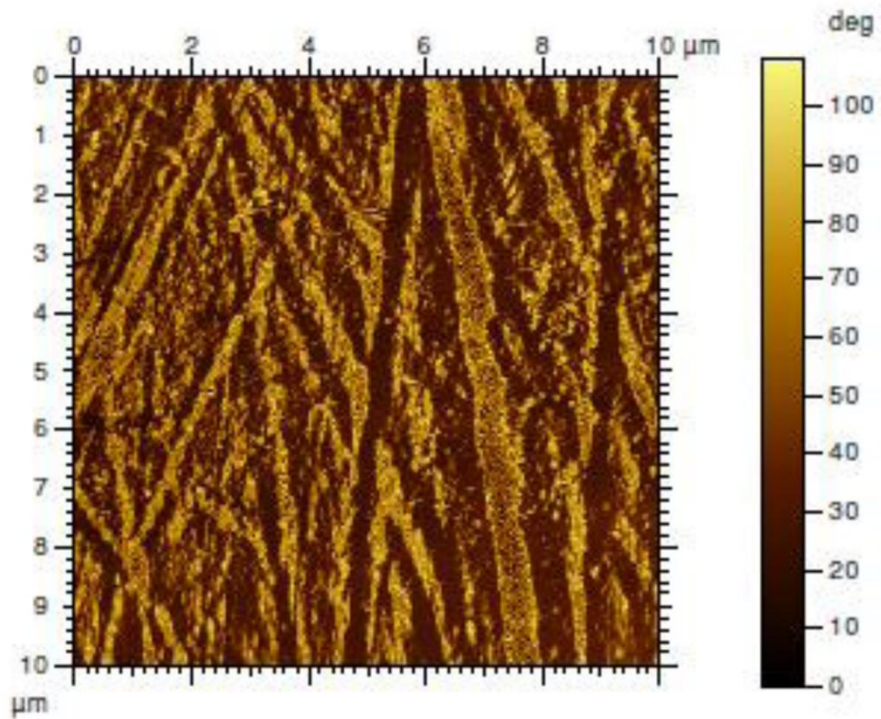
G = Rubbery modulus (at T<sub>trigger</sub>+20°C)

R = Universal gas constant (8.314 cm<sup>3</sup> MPa K<sup>-1</sup> mol<sup>-1</sup>)

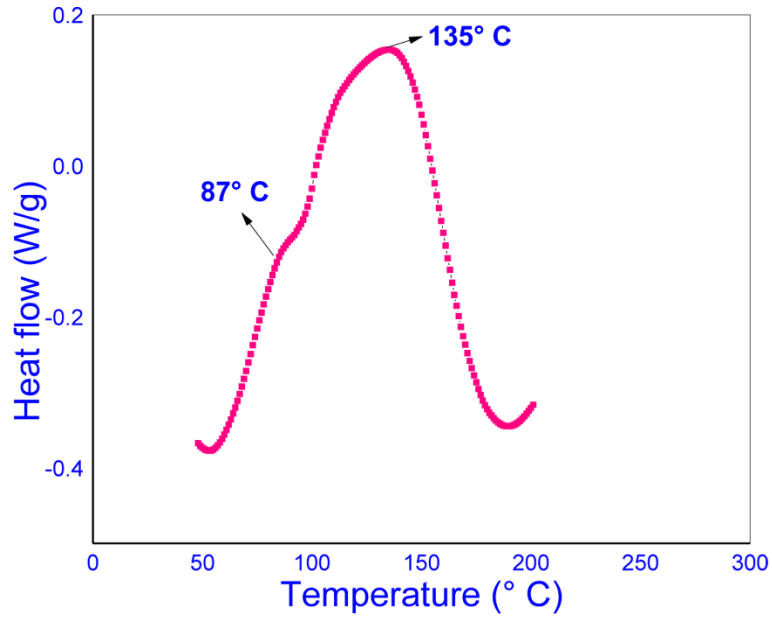
T = (T<sub>trigger</sub> + 20 °C) in Kelvin scale



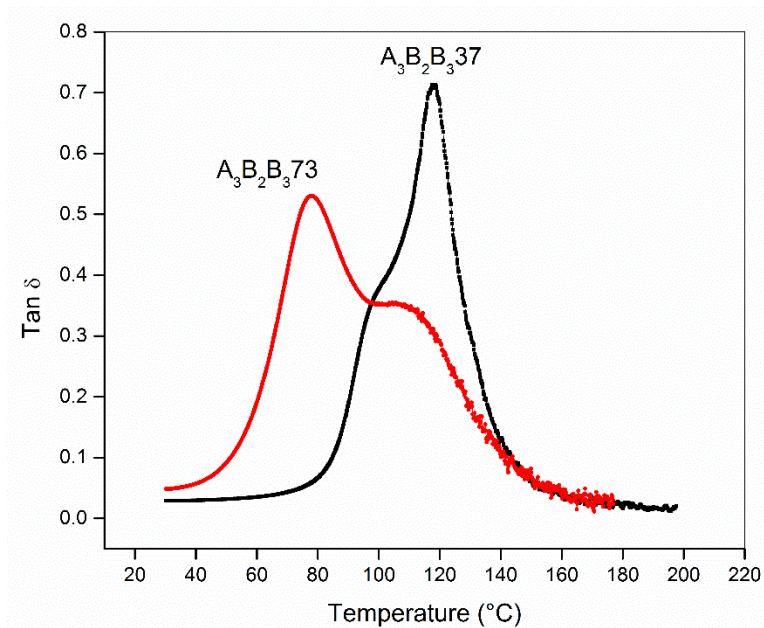
**SI 5** FTIR traces imply the completion of click polymerization after the temperature treatment of  $A_3B_2B_3$ . (Click polymerization at 135 °C)



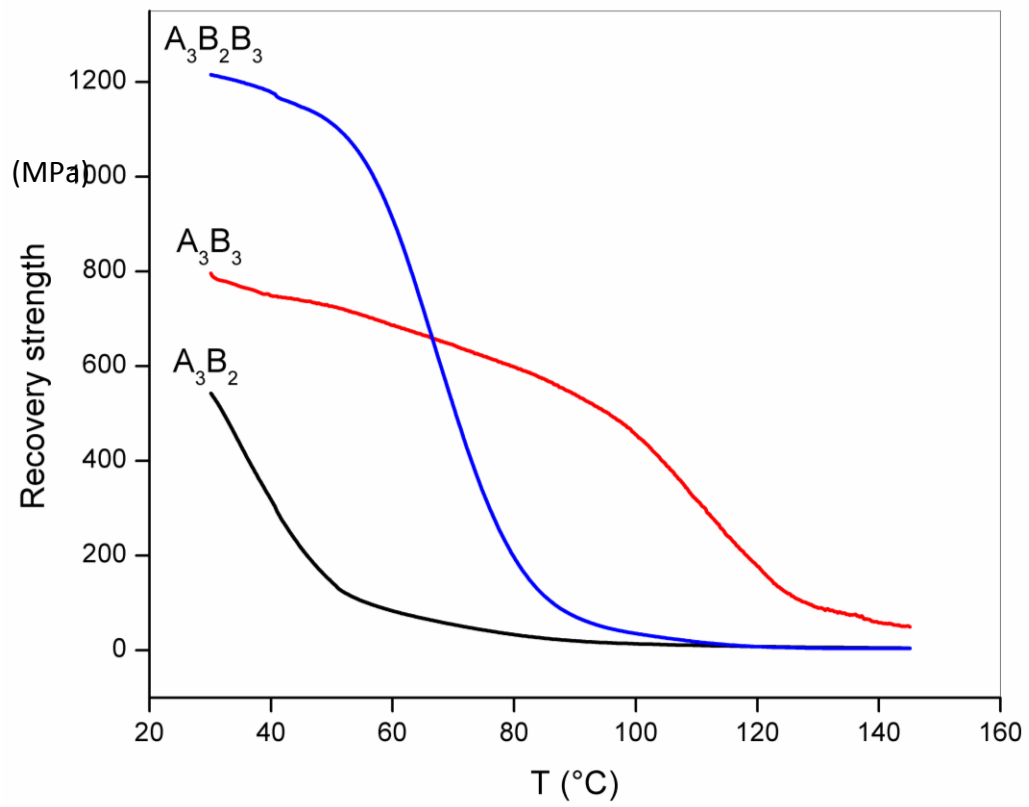
**SI 6** a) AFM image indicates absence of second phase or phase separation in  $A_3B_2B_3$  shape memory polymer (wrinkles on the surface (formed during curing) are seen) b) SEM image shows no phase separation in  $A_3B_2B_3$ .



**SI 7** Differential scanning calorimetry manifests the cross-linking of  $A_3B_2B_3$  system in two steps (both steps are overlapped) imply cohabitance of two kinds of click polymerizations (10 °C/min.).

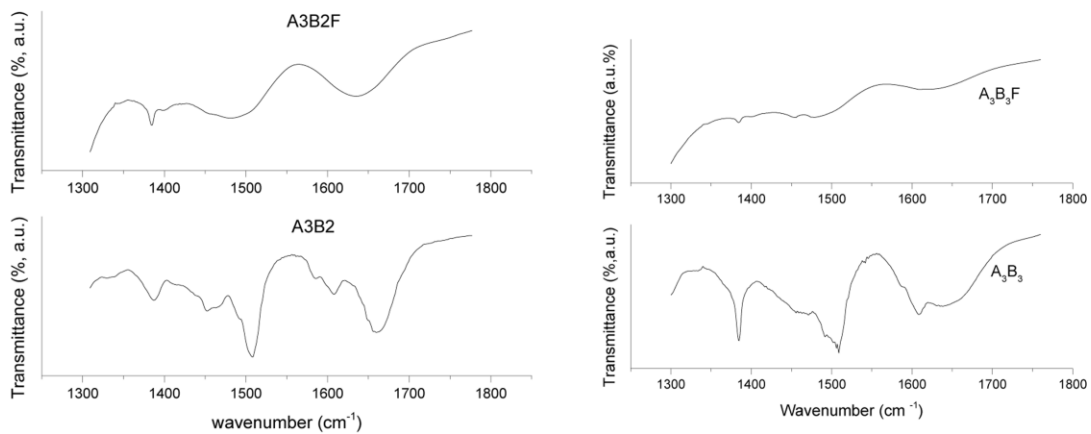
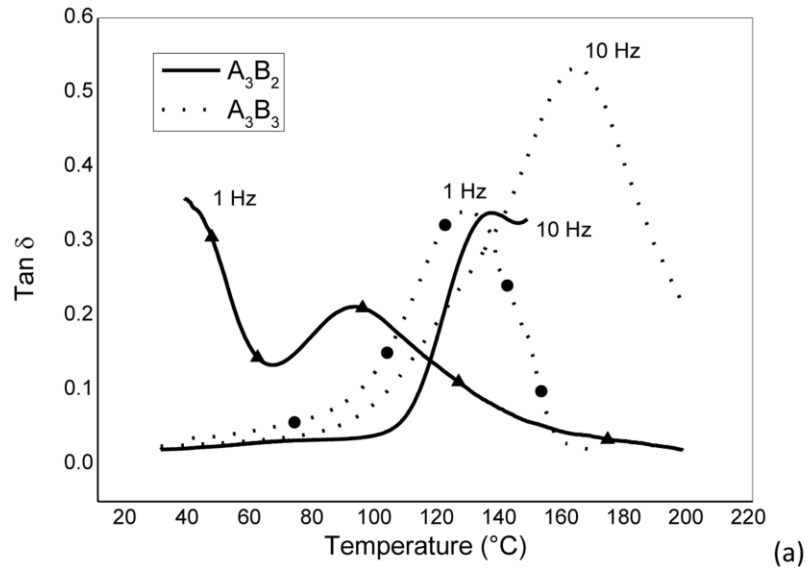


**SI 8** Dual trigger temperatures in  $A_3B_2B_373$  and  $A_3B_2B_337$  SMPs (from DMA, frequency=1 Hz).



**SI 9** Recovery strength of SMPs as a function of temperature (derived from DMA)





(b)

**SI 10a)** Dynamical mechanical analysis of  $\text{A}_3\text{B}_2$  and  $\text{A}_3\text{B}_3$  polymers at different applied frequencies (1Hz and 10 Hz) **b)** FTIR spectra showing hydrogen bonding of triazole groups with octafluoro-1,6-hexane diol in  $\text{A}_3\text{B}_2$  and  $\text{A}_3\text{B}_3$  cross-linked polymers.

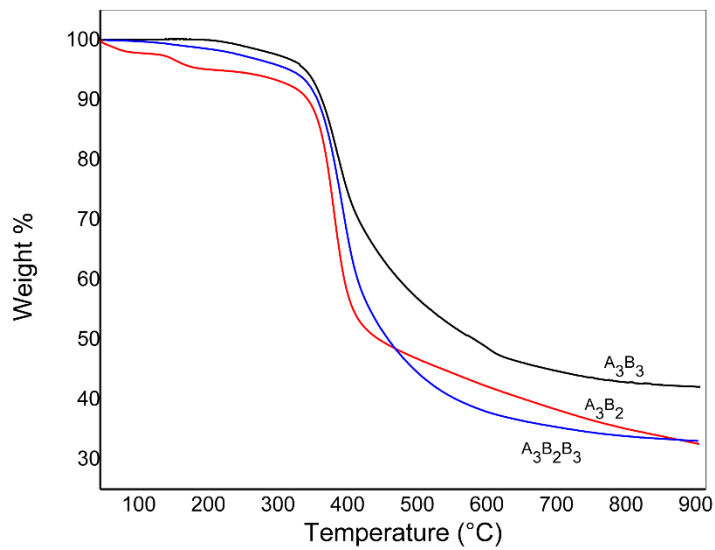
**SI 11** Calculation of water absorption ratio of SMPs

$$Q = [ (W_s / W_d) - 1 ] \times 100$$

Q = Water absorption (weight %)

$W_s$  - Weight of the swollen sample

$W_d$  - Weight of the dry sample



**SI 12** Thermogravimetric profiles of A<sub>3</sub>B<sub>2</sub>, A<sub>3</sub>B<sub>3</sub> and A<sub>3</sub>B<sub>2</sub>B<sub>3</sub> cross-linked polymers (N<sub>2</sub>, 10 °C/min.)