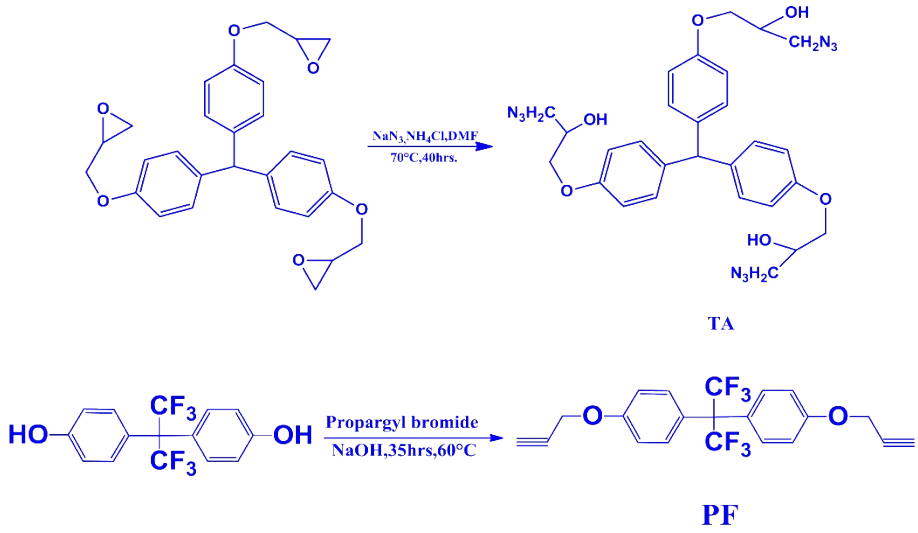
Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

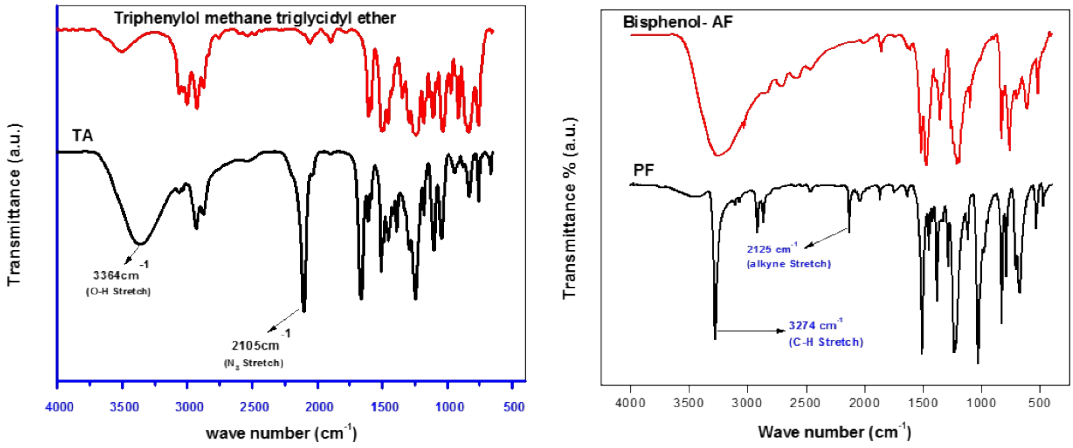
SI 1 Synthesis and characterization of monomers

Tris (4-glycidyloxy phenyl) methane (50 mmol), sodium azide (250 mmol), ammonium chloride (250 mmol) were magnetically stirred for half an hour at ambient condition in dimethylformamide (80ml) in a 250ml round bottom flask. The temperature was increased to 60°C and reaction continued for about 40 h. The resinous product was separated by pouring the mixture into distilled water and by subsequent decantation. The product was extracted with diethyl ether and washed several times with water. The solvent was stripped-off from the product by rota-vapour. The product which obtained as a yellow-orange viscous liquid was finally dried under vacuum at 60° C for 24 hrs. The monomer (TA) was characterized by FTIR, NMR and for epoxy content. FTIR (KBr, cm^{-1}): 2105 and 3384; ^1H NMR (ppm, $CDCl_3$): 4.2, 3.7, 3.2; Epoxy content $_{initial}$ = 6.3 meqiv/g and epoxy content $_{after\ reaction}$ = <0.1mequiv/g. The second monomer PF was synthesized as per our previous report (46). The characteristic peaks due to C-H and alkynic stretching were observed at 3274 cm^{-1} and 2125 cm^{-1} respectively in the FTIR spectrum of propargyl monomer. ^1H NMR (ppm, $CDCl_3$): 6.827.12(m), 4.69(s) 2.91(s). Hydroxyl content for propargyl monomer is 0 mg KOH/g.

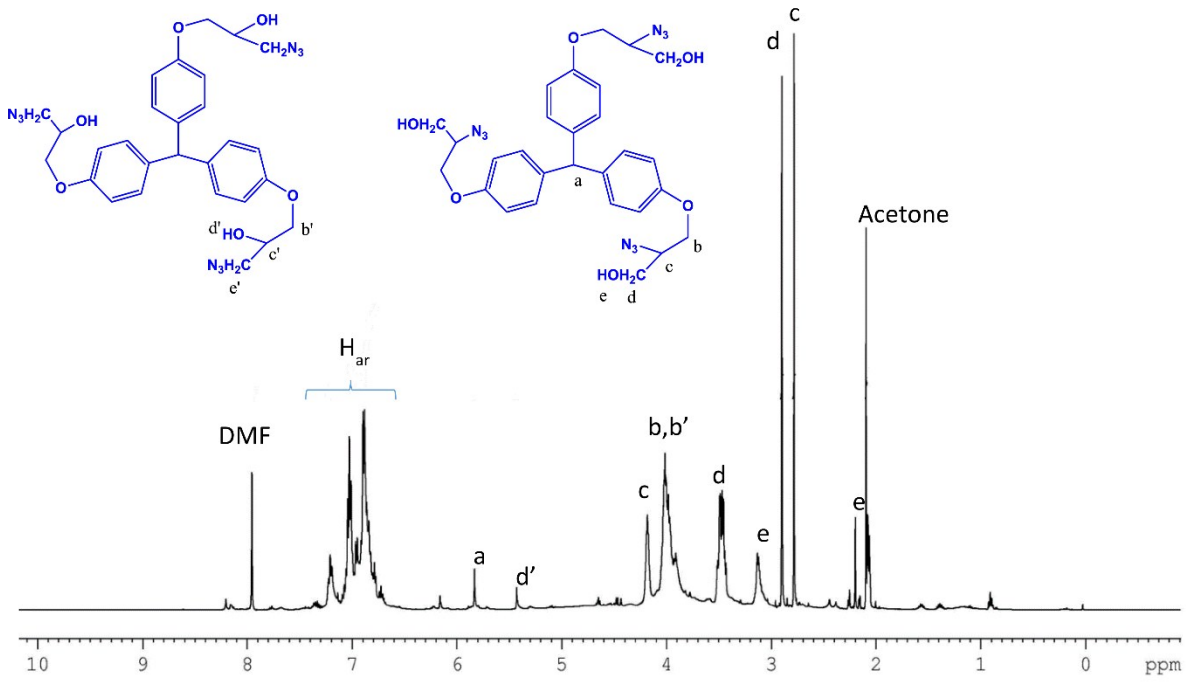


Schematic representation of azidation and propargylation

(SI 1a)

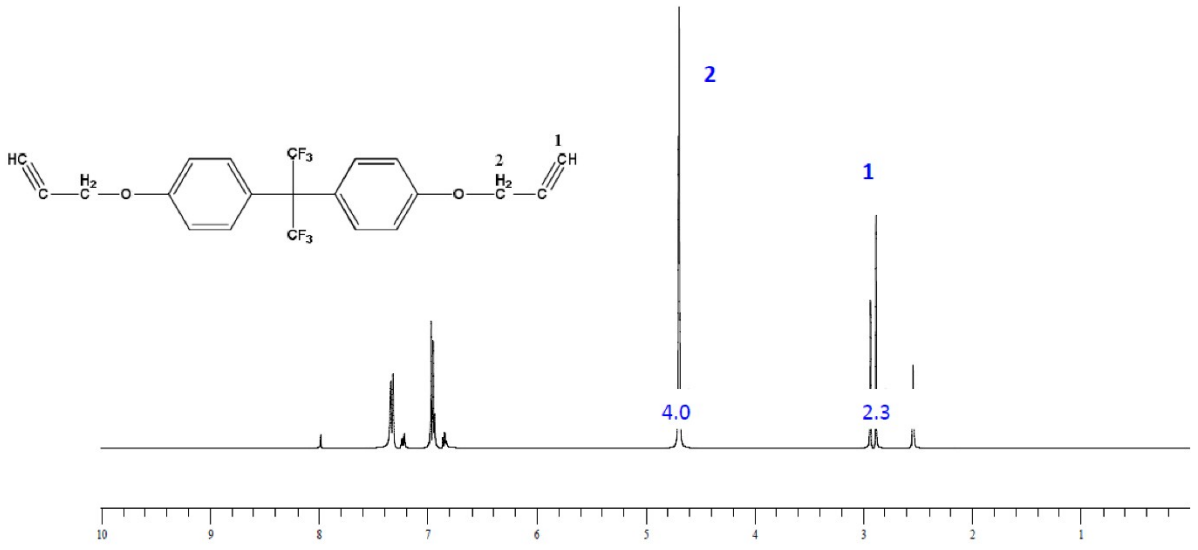


FTIR of a) tris azide (TA) and its parent compound triphenylol methane triglycidyl ether b) propargyl bisphenol AF (PF) and its parent compound bisphenol AF



[1]HNMR of [tris (4-(1-azido 3-oxy propan-2-ol) phenyl] methane (TA)

(SI 1 b)



^{1}HNMR of [4, 4'- (perfluoro propane -2, 2- diyl) bis (prop-2-yn-1-yloxy) benzene (PF)

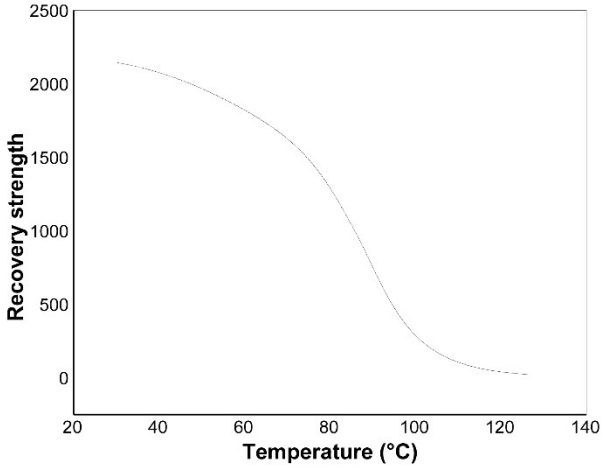
(SI 1 c)

SI 2 Calculation of recovery strength of heat actuated TAPF polymer as a function of temperature

$$\text{Recovery strength} = (G^2_m + L^2_m)^{1/2}$$

G_m= Sorage modulus at each temperature

L_m= Loss modulus at each temperature

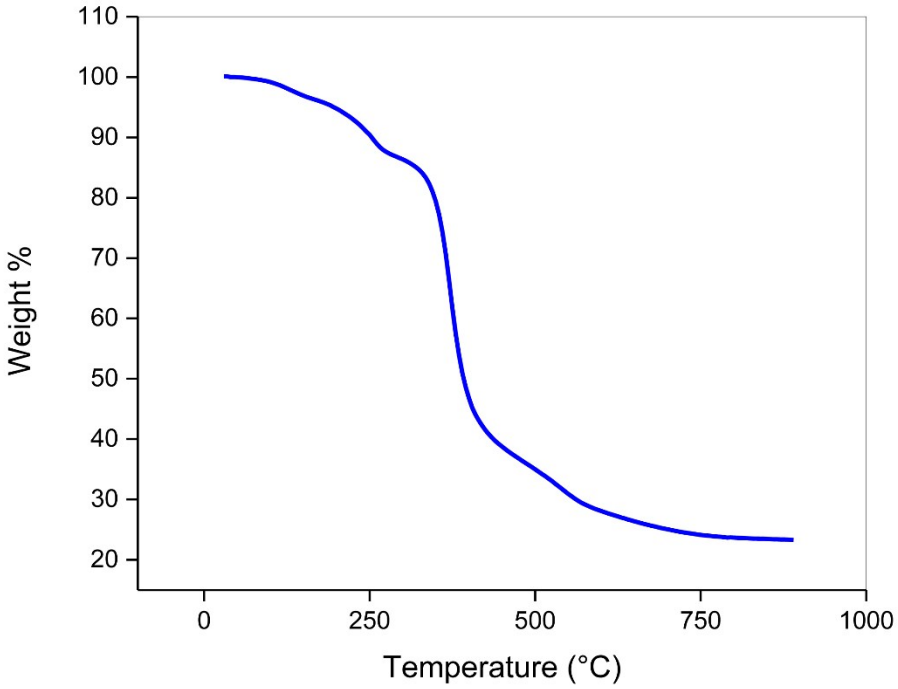


SI 3a Calculation of cross-link density

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

$$X_{density} = G/RT$$
$$= 23 /84\times10^{-6}$$
$$= \underline{6.8\times10^{3} \text{ moles/m}^3}$$

$X_{density}$ = Cross-link density in moles/m^3
G = Rubbery modulus (at $T_{trigger}$+20°C)
R= Universal gas constant (8.314 cm^3 MPa K^{-1} mol^{-1})
T= ($T_{trigger}$ +20 °C) in Kelvin scale

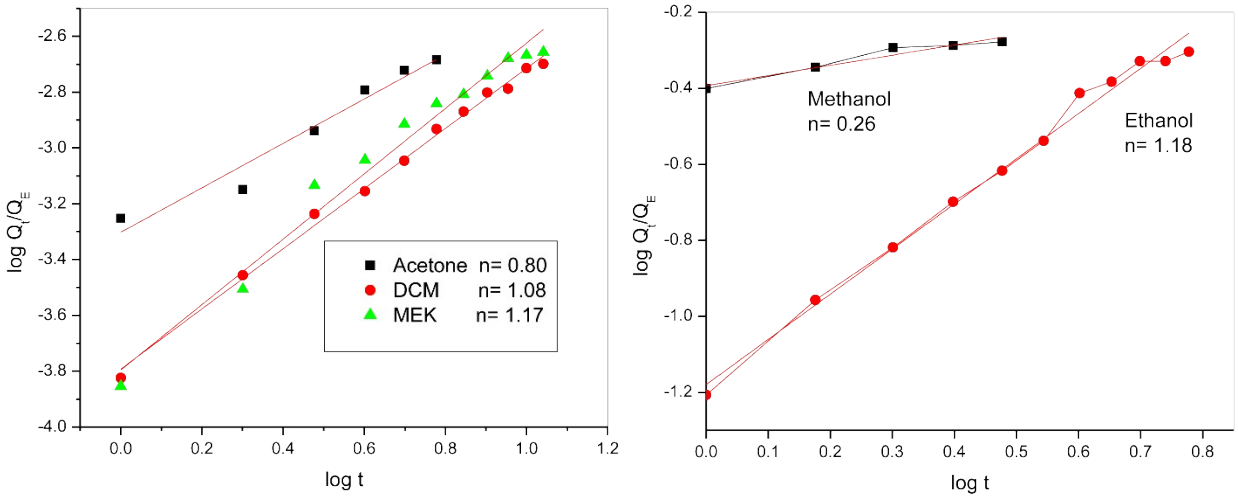


SI 3b Thermogravimetric analysis of TAPF

SI 4 Molecular level properties of type I and type II solvents

	Solvents	Δ $(Cal/cm^3)^{1/2}$	δ_p (mJ/m^3)	δ_H (mJ/m^3)	δ_d (mJ/m^3)
Type I	DMF	12.1	13.7	11.2	17.4
	Acetone	9.8	10.4	6.9	15.5
	DCM	9.9	6.3	7.8	18.2
	MEK	9.3	9.0	5.1	15.9
Type II	EtOH	12.9	8.8	19.4	15.8
	MeOH	14.3	12.3	22.3	14.7
	n-BuOH	23.2	5.7	15.8	16.0
Water		23.5	16.0	42.3	15.5

Δ- Hansen solubility parameter, δ_p – polarity factor, δ_H –hydrogen bonding factor, δ_d - dispersive factor,

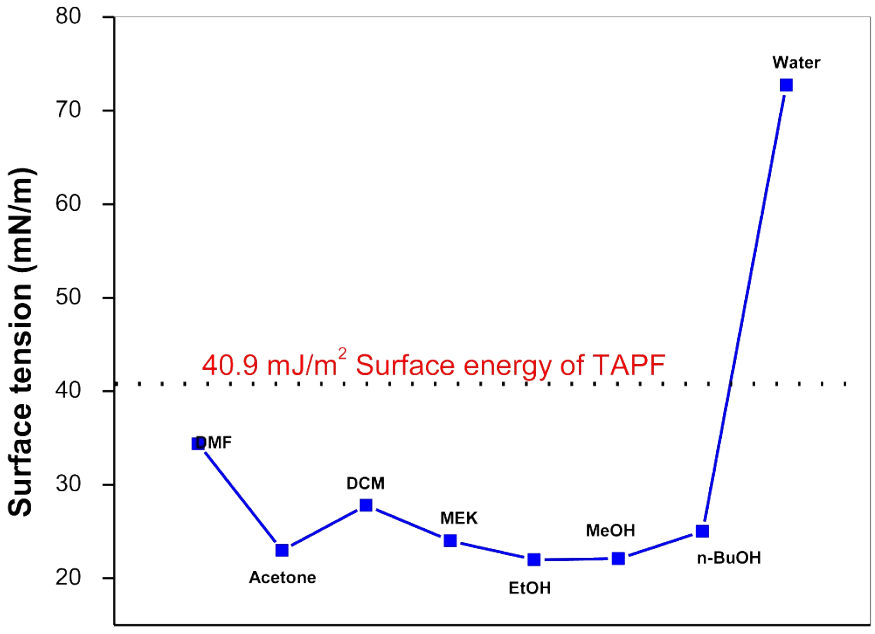


SI 5 Plots of log Q_t/Q_E *vs.* log t of TAPF in type I and type II solvents

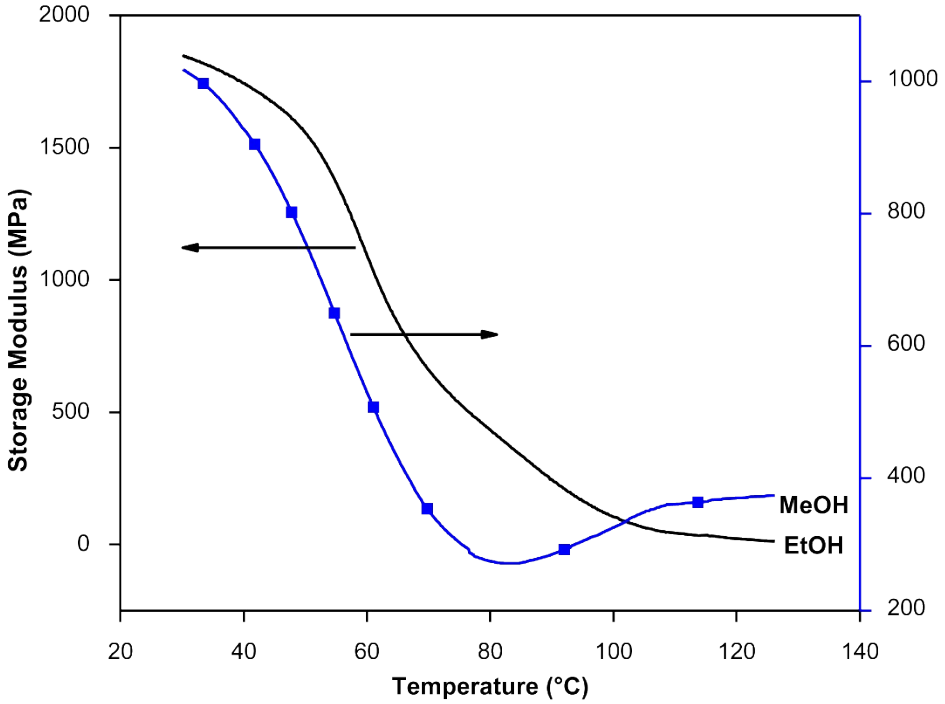
SI 6 Calculation of surface energy of TAPF polymer

Method: Owens, Wendt, Rabel and Kaelble (OWRK) Method

Liquid	Contact angle (°)	Surface energy (mN/m)	Dispersive force (mN/m)	Polar force (mN/m)
Water	80	40.9	36.8	4.1
Diidomethane	40			
Ethylene glycol	57			



SI 7 Surface tension of various solvents used in this study.



SI 8 DMA of TAPF sample after shape recovery from methanol and ethanol. A reduction in storage modulus was noticed but still above 1.5 GPa.