Supplementary Information

Nanostructure Controlled Shape Memory Effect in Polyurethanes

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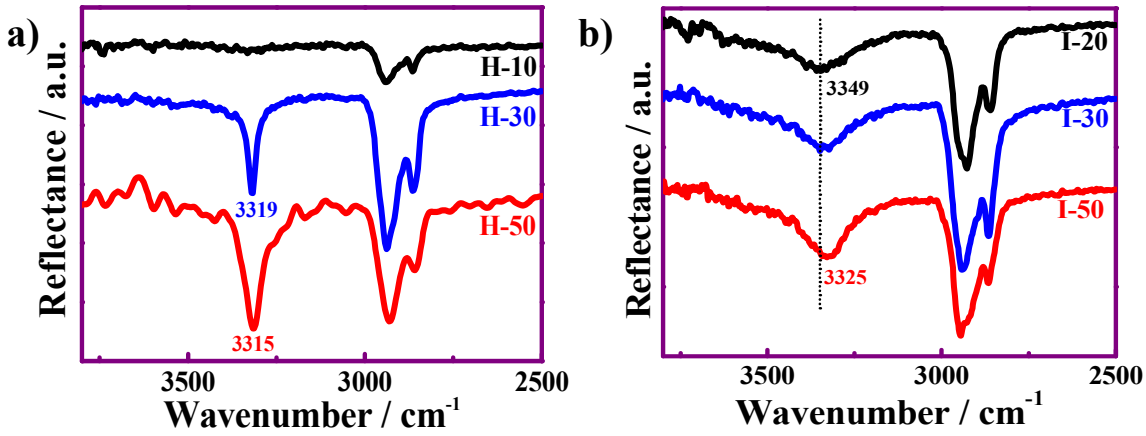
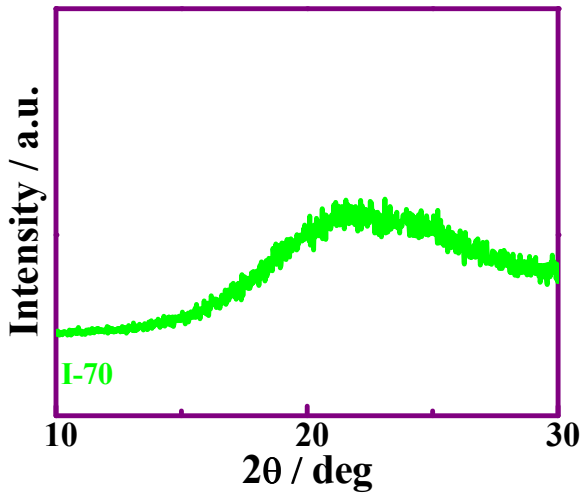
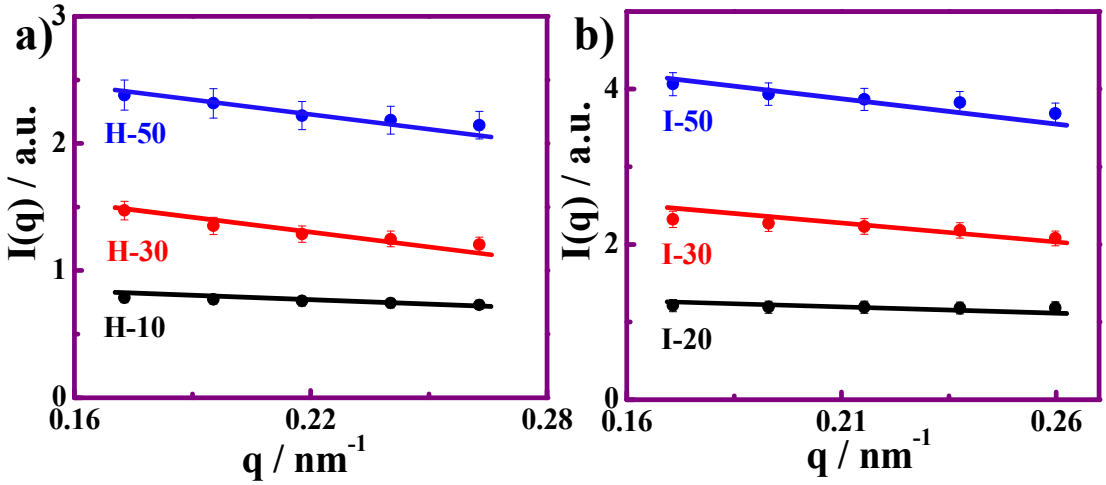


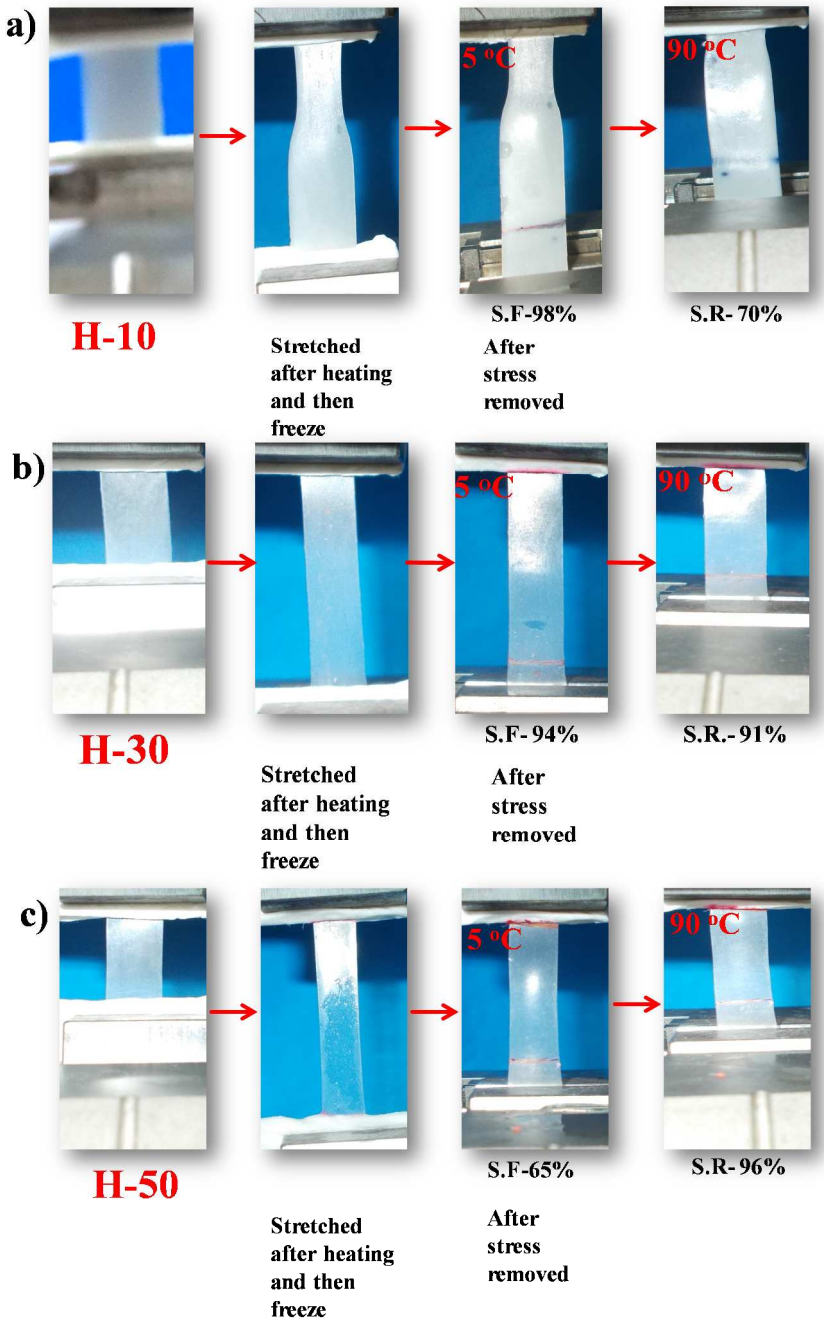
Supplementary Figure S1: FT-IR investigation of **a)** HMDI and **b)** IPDI based PUs. The peak appears at 3319 cm^{-1} in H-30 is for stretching of >N-H bond which shifts to 3315 cm^{-1} in H-50. While the peak appears at 3349 cm^{-1} in I-20 for stretching of >N-H bond shifts to 3325 cm^{-1}.



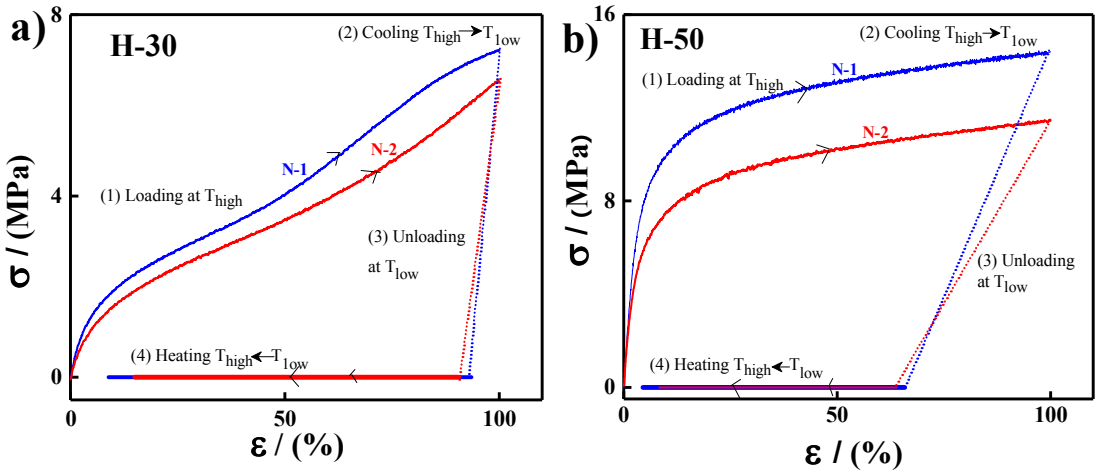
Supplementary Figure S2: The structure of IPDI based PU with HSC 70% as measured through XRD shows amorphous nature of the IPDI-based PU at higher HSC.



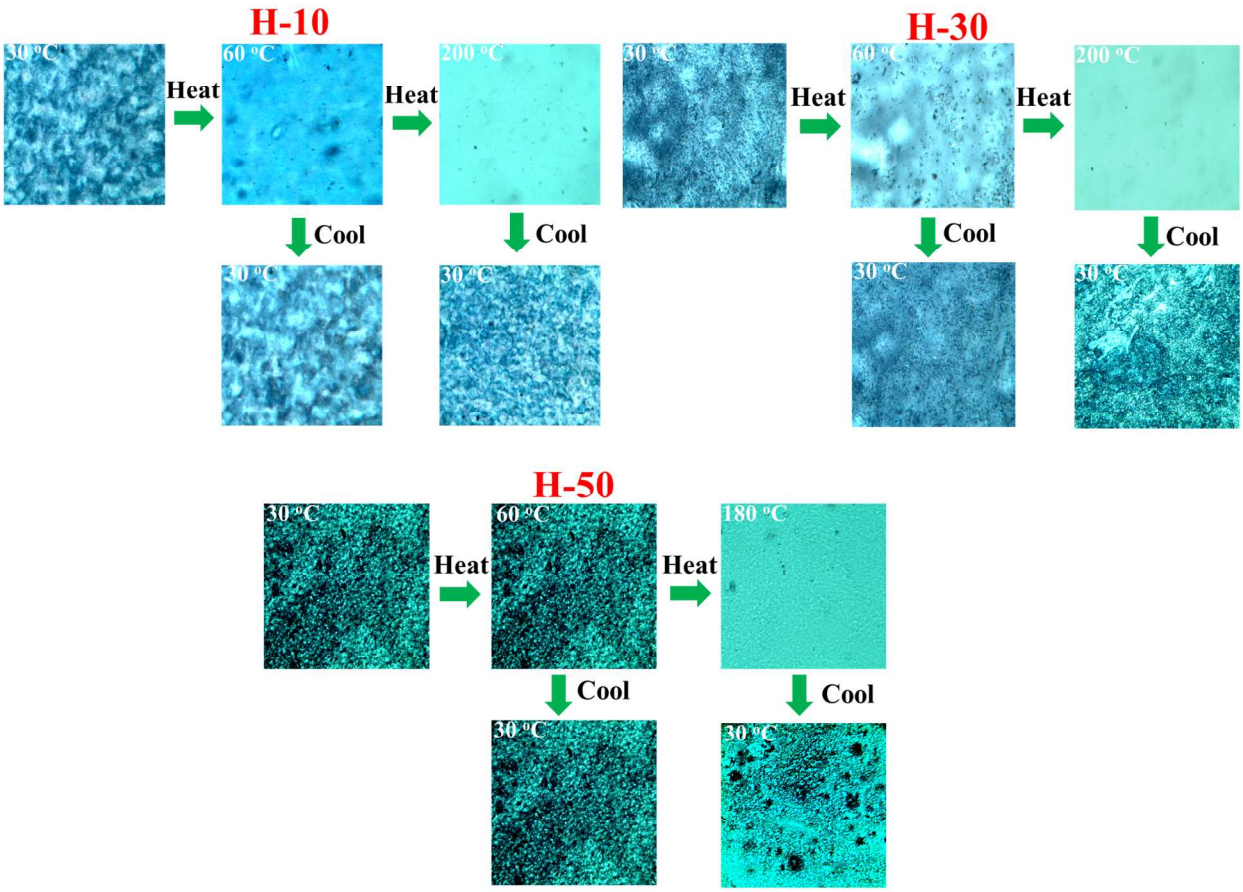
Supplementary Figure S3: Fitting of the initial q values SANS measurement of **a)** HMDI system and **b)** IPDI system with the Debye-Bueche Equation. The ξ value of HMDI system increases first from 1.3 nm to 2 nm in H-30 then decreases to 1.7 in H-50. While in IPDI system ξ value continuously increases from 1.3 nm to 1.9 nm with increasing HSC.



Supplementary Figure S4: The quantification of shape memory behavior is carried out using straight strips of **a)** H-10 **b)** H-30 and **c)** H-50 samples. The samples are stretched to 100 % then stretched shapes are fixed at 5 ^{o}C. The samples regain their permanent shape upon heating at 90 ^{o}C. The shape recovery ratio increases while fixity ratio decreases with increasing HSC.



Supplementary Figure S5: The thermomechanical cycle of **a)** H-30 and **b)** H-50, respectively, shows that the shape fixity and recovery ratio decreases with increasing no of cycles due to fatigue nature of the material. Shape memory effect is studied after stretching the samples uniaxially upto 100%.



Supplementary Figure S6: Changing of morphologies of H-10, H-30 and H-50 on heating cooling cycle. The black spots appears in the morphology is due to crystal part of both soft and hard segment. When temperature is increased to 60 ^{o}C, soft segment melts and black spots disappears for soft segment disappears as observed in H-10 and H-30 system. Further, on heating at 200 ^{o}C all the black spots disappears in all the three systems as the hard segment melts at that temperature.