Supporting Information:

**Fig.S1** Stress-strain curves of polymer network SiO$_2$-SMP with various compositions.

**Fig.S2** DSC curves both first and second heating and cooling of SiO$_2$@PCL.
Fig. S3 DSC curves both first and second heating and cooling of SiO$_2$-SMP.

Fig. S4 The photographs of homemade equipment for cycle thermally tensile test; (a) two temperature water bath; (b) the clamp for elongate and measure the elongation; (c) the sample in strain in the water bath.
Fig. S5 Schematic representation of the tensile mechanism.