Measurements

^{1}H NMR spectrum was obtained on a Bruker AN 600 spectrometer at 25 °C with deuterated chloroform as the solvent.

Fourier transform infrared (FT-IR) spectra were measured on a Nicolet 560 spectrophotometer using KBr pellets in the range from 4000 to 400 cm^{-1} under a resolution of 4 cm^{-1} at ambient temperature.

SEM analysis employed by a Quanta 250 scanning electron microscope (FEI, USA) to analyze the cross-section morphologies of films.

All fully expanded samples in deionized (DI) water were measured by differential scanning calorimetry (DSC) with a Q20 TA instrument at a heating or cooling rate of 1 K/min in a nitrogen atmosphere with a temperature range of 0-100 °C.

Stress-strain curves were measured for quantitatively evaluating the mechanical properties of all samples by an Instron 4465 testing machine. The elongation rate was set to 50 mm/min. The dimensions of dumbbell-shaped specimens were 20 mm (length) ×4 mm (width) ×0.5 mm (thickness).

TGA was carried out with a TGAQ50 TA instrument under nitrogen and air atmosphere from 50 to 700 °C with a heating rate of 10 K/min, respectively. Differential scanning calorimetry (DSC) measurements of all samples were performed on a Q20 TA instrument with a heating or cooling rate of 5 K/min under nitrogen atmosphere.

The optical images of these samples were obtained using a Nikon D5200 camera.

The transmittance spectra in the wavelength range of 200-2800 nm were collected using a UV-Vis-NIR spectrophotometer (UV-3600, Shimadzu, Japan) at normal incidence and equipped with a heating and cooling stage (PE120, Linkam, UK).

The integral luminous transmittance T_{lum} (380-780 nm), IR transmittance T_{IR} (780-2500 nm) and solar transmittance T_{sol} (280-2500 nm) were calculated by Equation as follow: [1]

$$T_{lum\,/\,IR\,/\,solar} = \frac{\int \varphi_{lum/IR/solar}(\lambda)T(\lambda)d\lambda}{\int \varphi_{lum/IR/solar}(\lambda)d\lambda} \qquad (1)$$

where T(λ) denotes the recorded transmittance at a particular wavelength, $\phi_{lum}(\lambda)$ is the standard luminous efficiency function for the photopic vision[2] of human eyes in the wavelength range of 380-780 nm, $\phi_{IR}(\lambda)$ and $\phi_{sol}(\lambda)$ is the IR/solar irradiance spectrum for air mass 1.5 (corresponding to the sun standing 37° above the horizon with 1.5 atmosphere thickness, corresponds to a solar zenith angle of =48.2)[3].

$\Delta T_{lum/IR/sol}$ was obtained by $\Delta T_{lum/IR/sol} = T_{lum/IR/sol,\ 20°C/} - T_{lum/IR/sol,\ 40°C/}$.[1]

Table S1 Thermochromic Performance (Solar Transmittance Modulation, ΔT_{sol}, after Phase Transition, and Luminous Transmittance, T_{lum}, before Phase Transition) in Some of the Best Reported PNIPAm-based Films.

ΔT_{sol}	T_{lum}	Thickness	Ref.
73.5%	80%	400 μm	[4]
81.3%	87.2%	380 μm	[5]
68.1%	90%	1 cm	[6]
49.6%	85.8%	78 μm	[7]
86.15%	82.75%	100 μm	[8]
67.1%	94.5%	100 μm	[9]
63.24%	59.53%	100 μm	This work

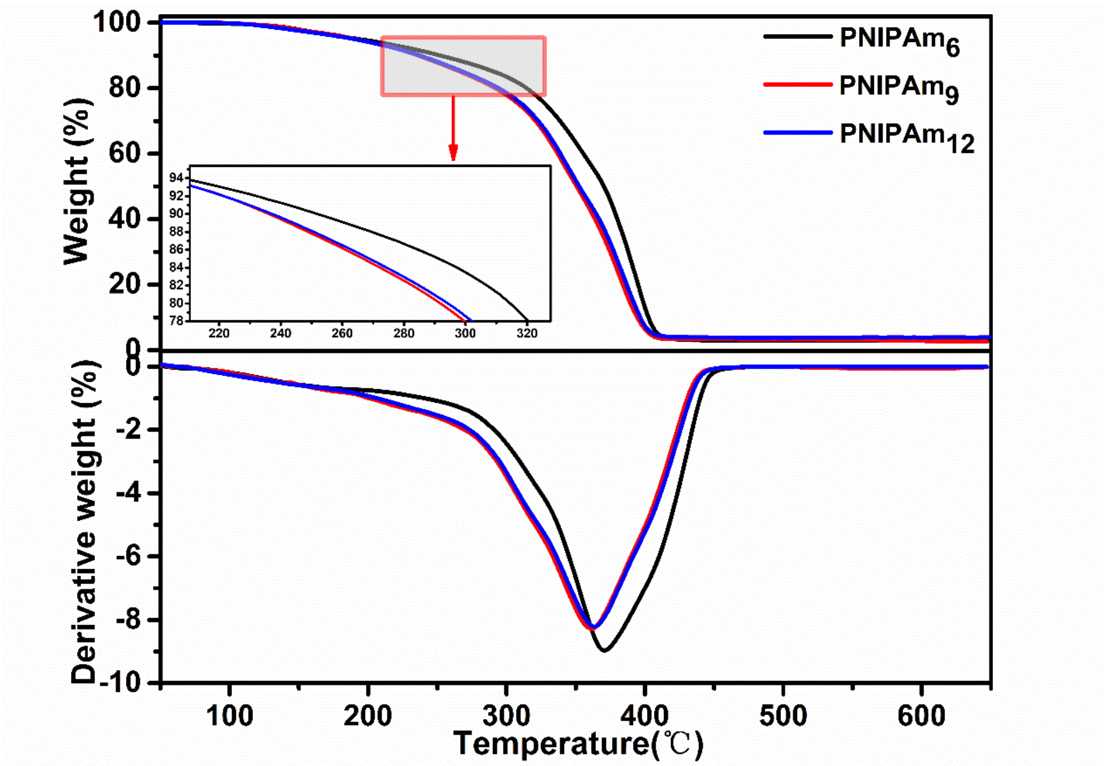

Fig.S1. The thermal stabilities of the $PNIPAm_n$: (up) TGA and (down) DTG curves.

Table S2 Thermal stabilities of the $PNIPAm_n$.

Sample	$T_{-5wt\%}$(°C)	T_{max1}(°C)	Residual mass (%)
$PNIPAm_6$	193.49	370.77	2.96
$PNIPAm_9$	191.68	361.34	3.35
$PNIPAm_{12}$	190.71	363.09	3.85

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