sensors

Supplementary

Simply Fabricated Inexpensive Dual-Polymer-Coated FABRY-Perot Interferometer-Based Temperature Sensors with High Sensitivity

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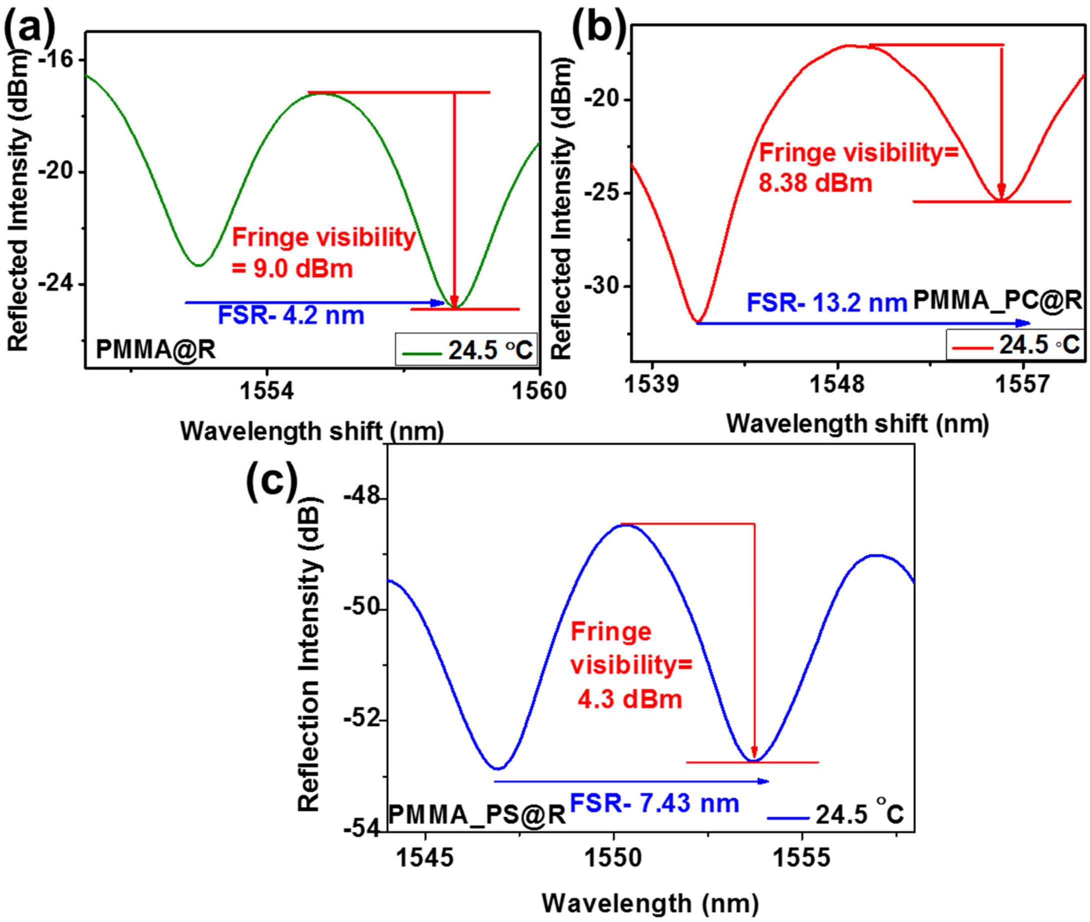

Figure S1. Reflected spectra for (**a**) PMMA@R, (**b**) PMMA_PC@R, and (**c**) PMMA_PS@R sensors for checking reproducibility.

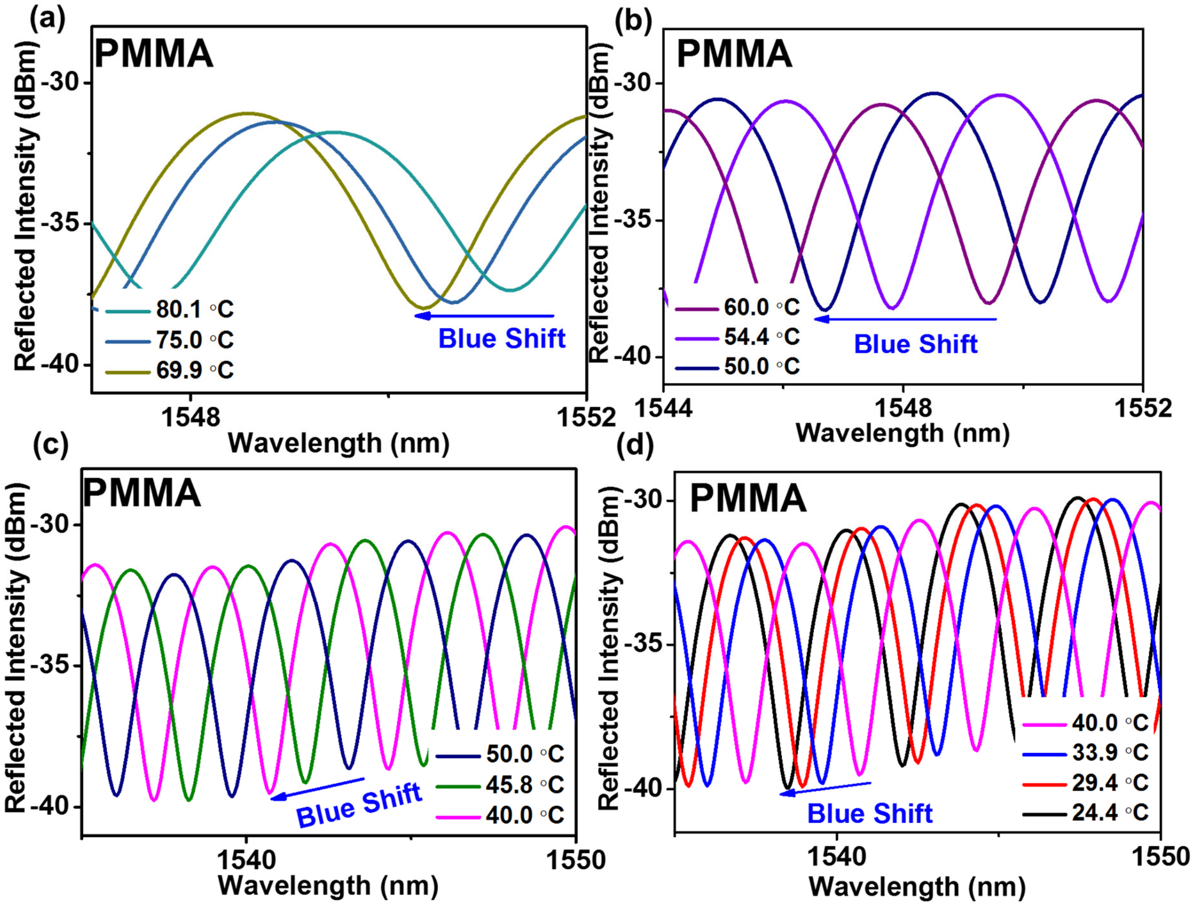

Figure S2. (**a**-**d**) Reflection spectra of the PMMA coated sensor in response to a temperature decrease (Blue shift).

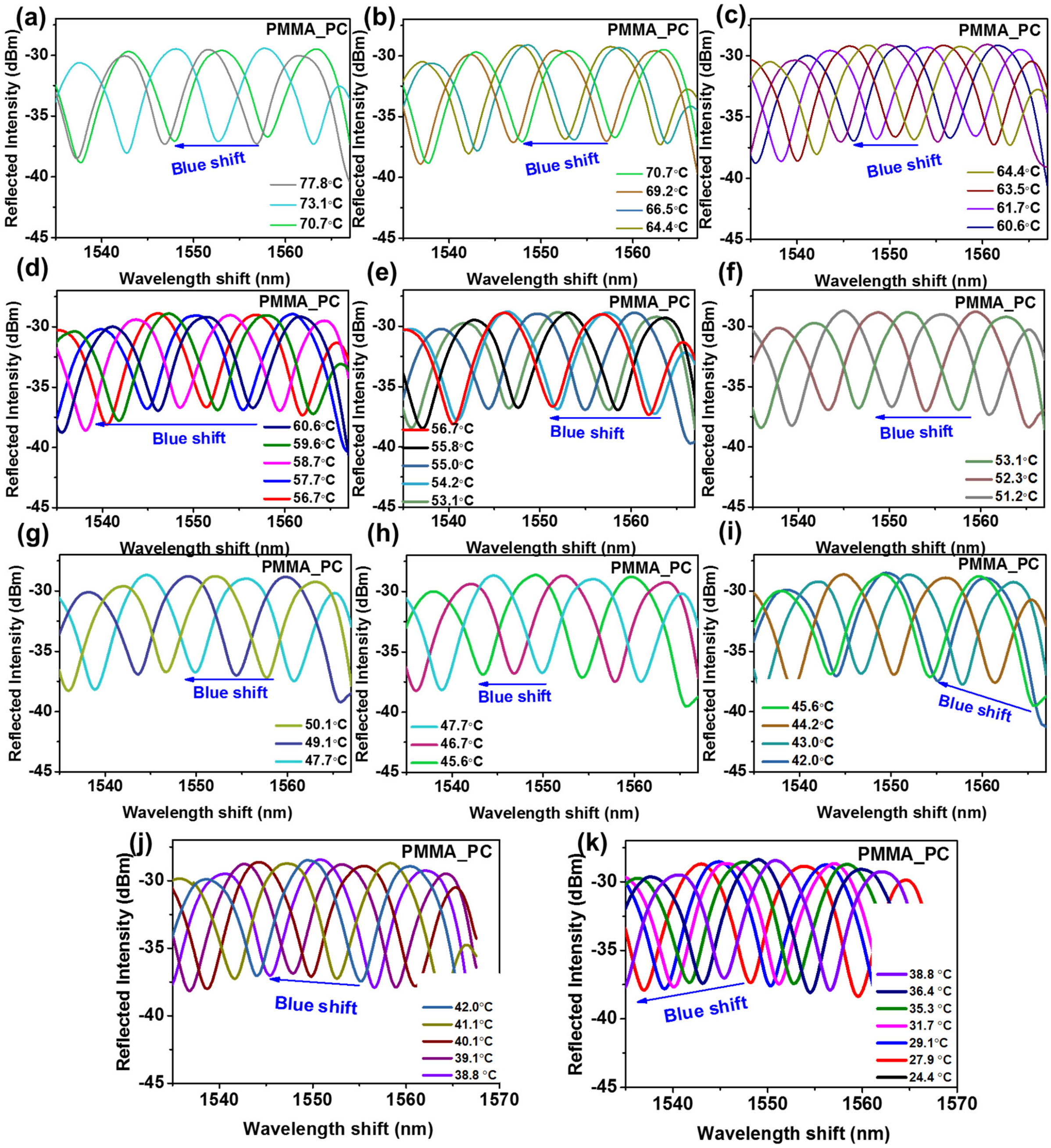

Figure S3. (**a**-**k**) Reflection spectra of the PMMA_PC coated sensor in response to a temperature decrease (Blue shift).

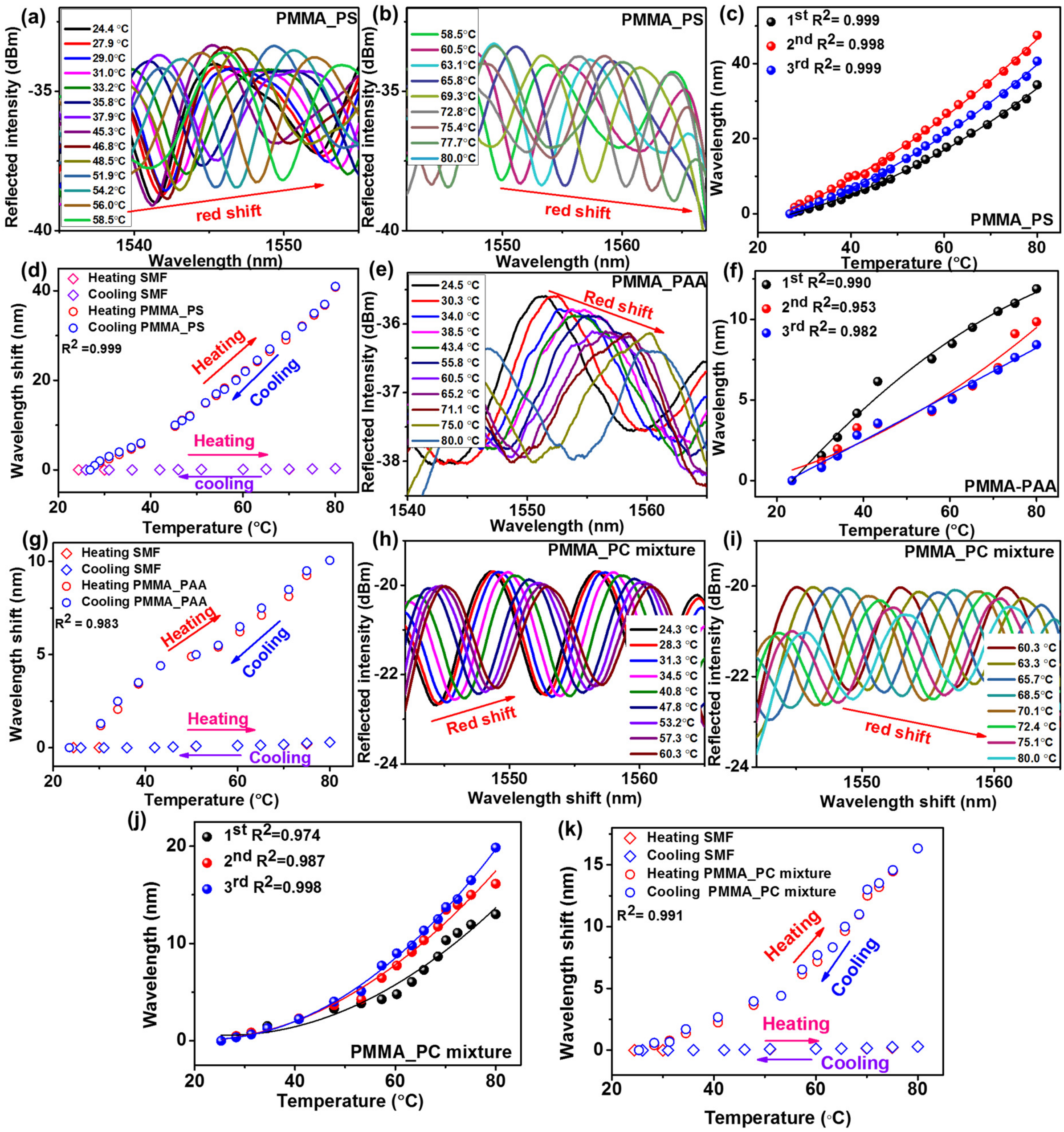

Figure S4. (**a**-**b**) Reflection spectra of the PMMA_PS coated sensor in response to a temperature increase (red shift). (**c**) wavelength shift for three measurements and (**d**) average wavelength shift of PMMA-PS sensor. (**e**) reflection spectra of the PMMA_PAA coated sensor in response to a temperature increase (red shift). (**f**) wavelength shift for three measurements and (**g**) average wavelength shift of PMMA-PAA sensor. (**h**-**i**) reflection spectra of the PMMA_PC mixture coated sensor in response to a temperature increase (red shift). (**j**) wavelength shift for three measurements and (**k**) average wavelength shift of PMMA-PC mixture sensor.

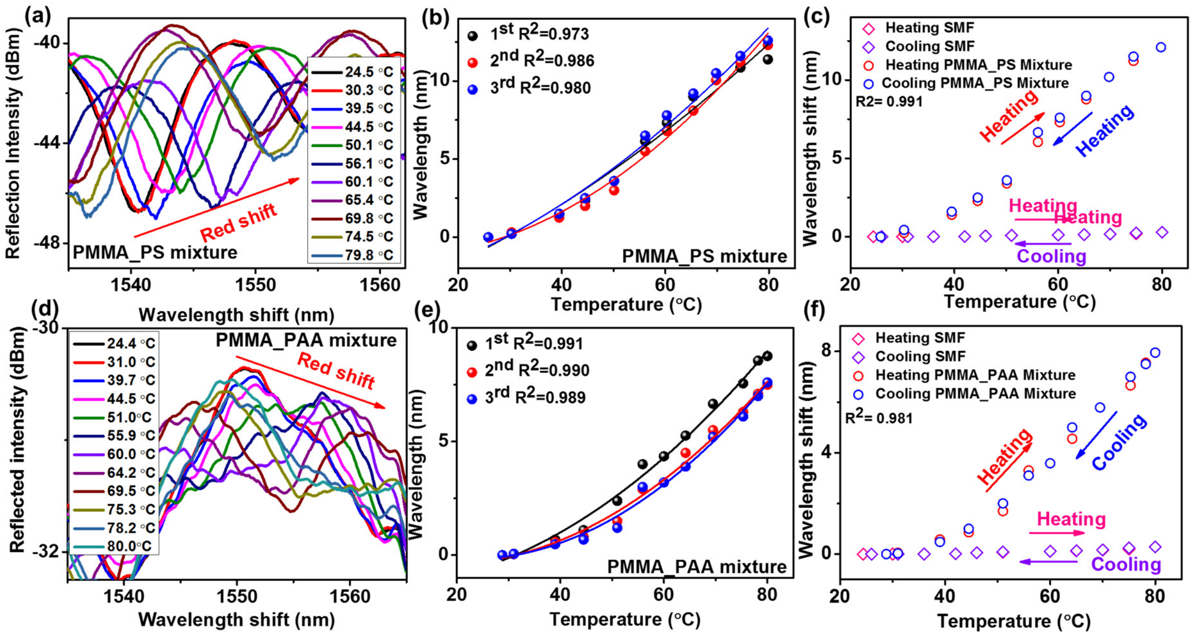

Figure S5. (**a**) Reflection spectra of the PMMA_PS mixture coated sensor in response to a temperature increase (red shift). (**b**) wavelength shift for three measurements and (**c**) average wavelength shift of PMMA-PS mixture sensor. (**d**) reflection spectra of the PMMA_PAA mixture coated sensor in response to a temperature increase (red shift). (**e**) wavelength shift for three measurements and (**f**) average wavelength shift of PMMA-PAA mixture sensor.

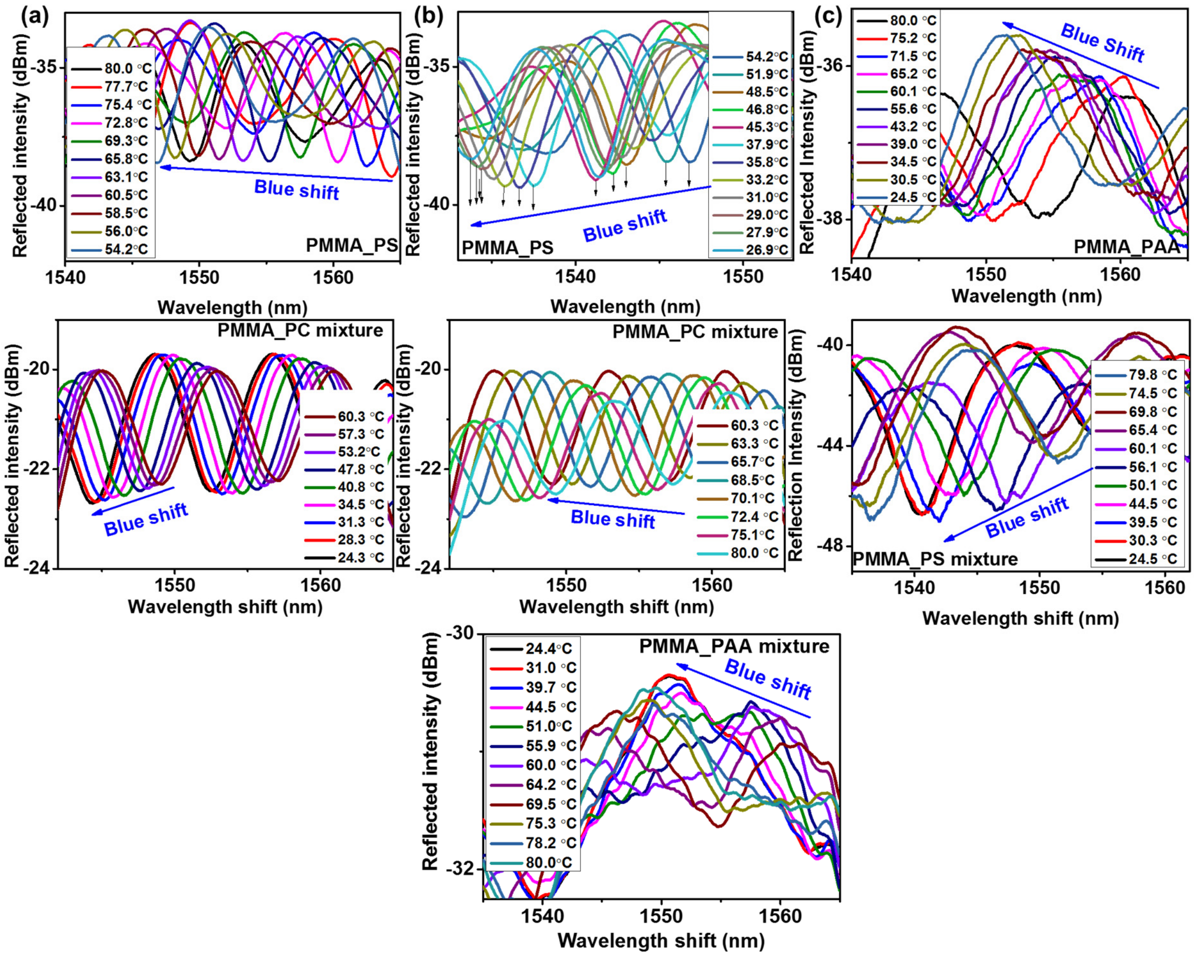

Figure S6. The reflection spectra of in response to a temperature decrease (blue shift) (**a**-**b**) PMMA_PS, (**c**) PMMA_PAA, (**d**-**e**) PMMA_PC mixture, (**f**) PMMA-PS mixture, and (**g**) PMMA_PAA mixture. .

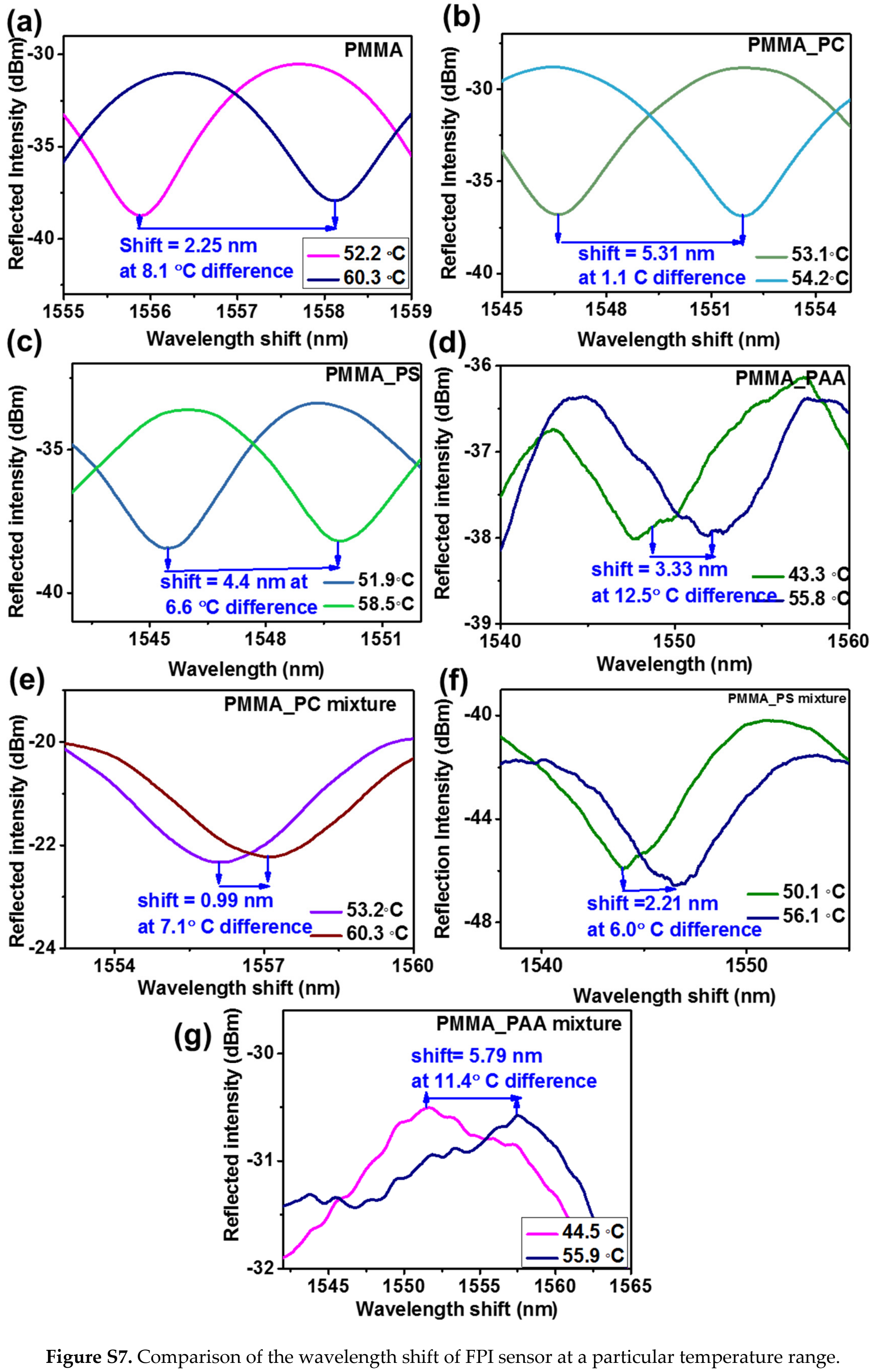

Figure S7. Comparison of the wavelength shift of FPI sensor at a particular temperature range.

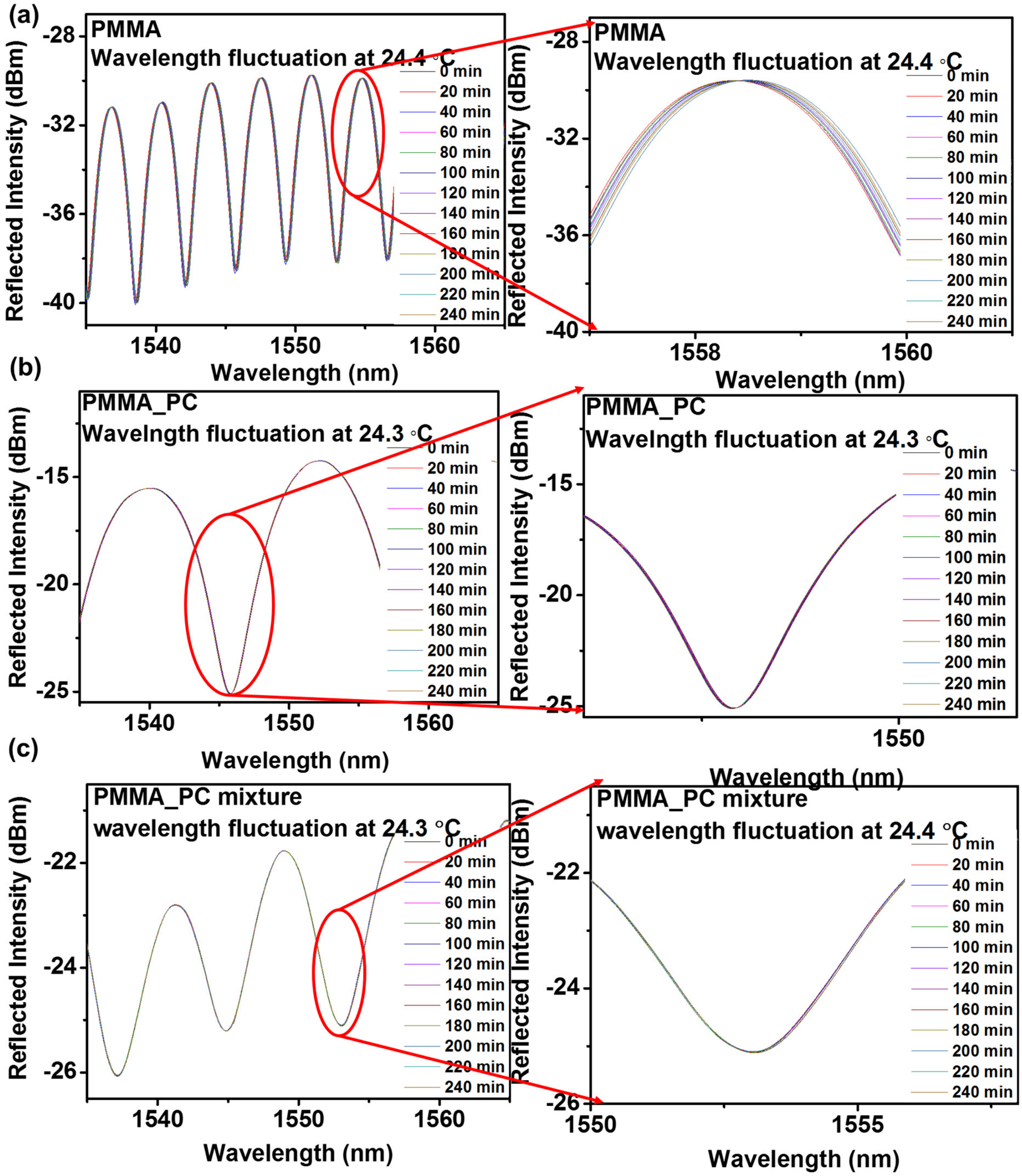

Figure S8. Wavelength of spectral dip response at a constant temperature and at various time intervals of (a) PMMA, (b) PMMA_PC and PMMA-PC mixture.

Table S1. Comparison of sensitivities and preparation methods/complication of various fiber optic temperature sensors.

Type of Fiber	Polymer	T(°C)	Sensitivity (pm °C^{-1})	Method	Ref
Fabry–Perot Interferometer	polyvinyl alcohol	25-100	~193.3	Low sensitivity, Stepper motor needed for coating	[1]
Fiber Bragg grating	Norland Optic Adhesive-61	10-50	19.5	Operation temperature range is small, UV curing method needed for coating the polymer	[2]
Fiber Fizeau interferometer	Norland Optic Adhesive-61	10-50	269.5	Operation temperature range is small, UV curing method needed for coating the polymer	[2]
Fabry–Perot Interferometer	Poly (vinyl chloride)	25-60	366.0	Plastic welder used for coating, low sensitivity	[3]
Single mode + Hollow core fiber	polydimethylsiloxane	51-70.5	2703.5	expensive method, poor reproducibility, requires expensive techniques, complex method	[4]
Microfiber mode interferometer	polydimethylsiloxane	20-48	3101.7	requires expensive techniques,	[5]
Fabry–Perot Interferometer	step-curing ultraviolet photoresist and polydimethylsiloxane	20-75	689.68	Low sensitivity, UV curing method needed for coating	[6]
Fabry–Perot Interferometer	Polycarbonate	20-140	245.4	Low sensitivity,	[7]
Fabry–Perot Interferometer	Polystyrene	25-100	439.89	Low sensitivity,	[8]
Fiber Bragg grating	gold-coated shallow-tapered chirped	30-80	9.893	CO_2 laser splicing system, Gold Layer Sputtering, optical backscatter reflectometer interrogator	[9]
Fiber Bragg grating +Single mode +Multimode Fiber	–	0-900	13.4	femtosecond laser inscription, fusion splicer	[10]
Ultra-long period fiber grating + graded index multimode fiber	doping of germanium	30-150	90.77	Splicing by arc discharge, fusion splicer	[11]
Fabry–Perot Interferometer	**PMMA_PC**	**24.4-80**	**2142.5**	**Simple , cheap, reproducible, high sensitivity**	**This work**
Fabry–Perot Interferometer	**PMMA_PS**	**24.4-80**	**785.5**	**Simple , cheap, reproducible, high sensitivity**	**This work**

Table S2. Comparison of the wavelength fluctuation for PMMA, PMMA_PC and PMMA_PC mixture sensors.

Sensor	Average Temperature for Wavelength Fluctuation (°C)	Standard Deviation for Temperature (°C)	Standard Deviation for Wavelength (nm)
PMMA	24.4	0.0674	0.0555
PMMA_PC	24.3	0.0699	0.0402
PMMA_PC mixture	24.3	0.0632	0.0239

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