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Supporting information

Fabrication of remote controllable devices with multistage responsiveness based on NIR light-induced shape memory ionomer containing various bridge ions

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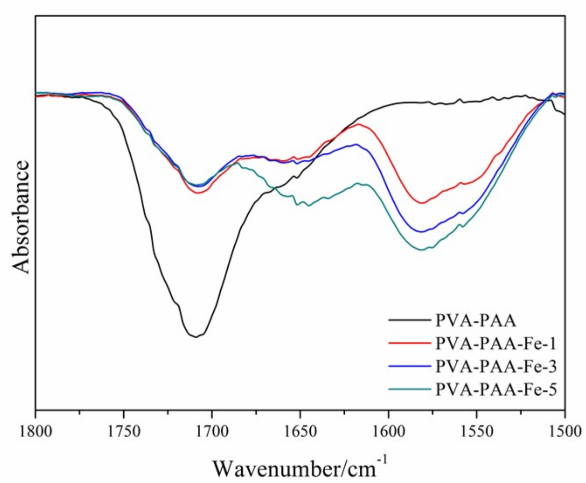

Figure S1 FTIR spectra of PVA-PAA and PVA-PAA-Fe-1, -3 and -5.

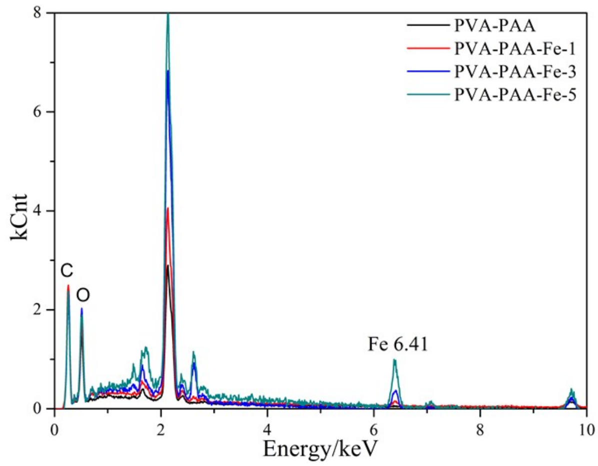

Figure S2 EDS spectra PVA-PAA and PVA-PAA-Fe-1, -3 and -5.

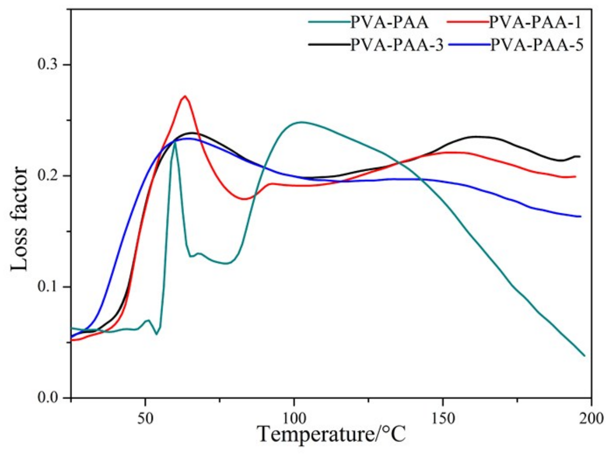

Figure S3 DMA curves of PVA-PAA and PVA-PAA-Fe-1, -3 and -5.

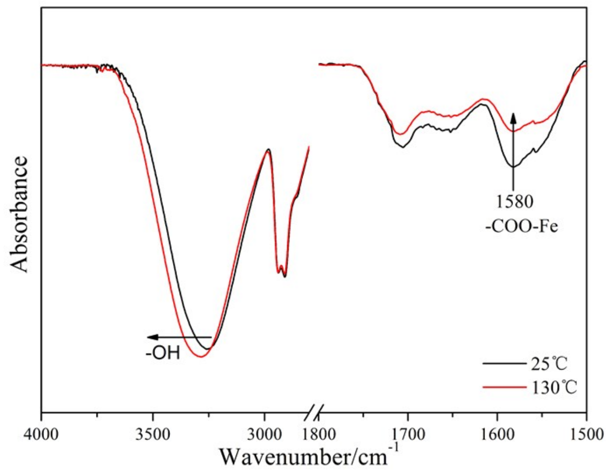

Figure S4 FTIR spectra of PVA-PAA-Fe at different temperature

Table S1 Physical properties and light-induced shape memory property

Sample	Q(%)	T_g(°C)	R_f(%)	R_r(%)	Ion content [a](%)
PVA-PAA	177.5±26.2	59.8	/	/	/
PVA-PAA-Fe-1	114.0±13.3	63.3	94.2±1.9	93.5±1.2	1.3
PVA-PAA-Fe-3	72.3±7.7	65.7	93.5±0.5	94.5±1.9	3.7
PVA-PAA-Fe-5	70.0±9.5	64.6	95.7±0.2	94.8±0.4	4.3
PVA-PAA-Cu	144.9±16.8	60.0	95.3±0.5	94.6±1.1	5.5
PVA-PAA-Co	177.7±16.3	59.9	96.1±0.6	93.0±1.1	3.2

[a] Ion content is calculated from the residual mass of metallic oxide from TGA curves.

Table S2 Comparison of some shape memory ionomers with PVA-PAA ionomer

Material	Tensile strength (MPa)	Elongation at break(%)	R_f(%)	R_r(%)	stimulus
Polyurethane ionomer[1]	39.5	/	95	75	heat
Polyurethane ionomer[2]	26.7	920	93	82	heat
Poly(oxyethylene-b-butylene adipate) ionomer [3]	/	/	97.4	78.3	heat
Royalene 521[4]	1.4	75	81.5	89.7	heat
Surlyn 9520[5]	24.9	702	99	88	heat
Sulfonated poly(ether ether ketone)/ sodium oleate[6]	40	45	96	100	heat
Epoxidized natural rubber ionomer[7]	12	250	77.2	98.4	heat
Surlyn 8940[8]	33	440	84.9	100	heat
Surlyn 9520/ zinc stearate[9]	13.9	9.4	100	98	heat
poly(styrene-b-butadiene-b-styrene) ionomer[10]	14.2	100	85.9	97	heat
PVA-PAA ionomer (this study)	56.1	107	96	95.	Heat/NIR

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