

Supporting information

## Novel Double-Networked Polyurethane Composites with Multi-Stimuli Responsive Functionalities

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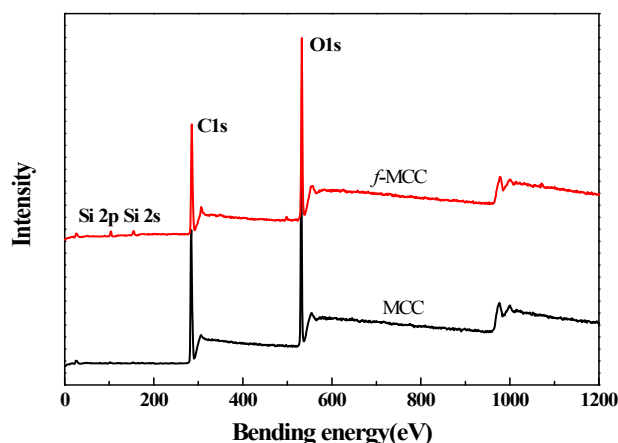
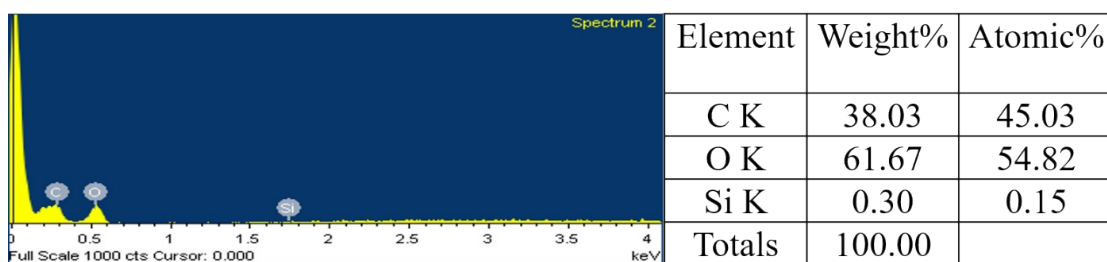


Fig. S1. XPS survey of MCC and *f*-MCC

Table S1. Analysis of C 1s peaks and their relative atomic percentage of MCC and *f*-MCC from XPS

Sample	XPS C 1s peaks fitting binding energy (eV; relative atomic percentage, %)			
	C-C	C-H	C-O	C-O-C
MCC	284.6 (33.67)		286 (40.83)	288.1 (25.5)
<i>f</i> -MCC	284.6 (25.47)	285.1 (13.88)	286.3 (46.75)	288.3 (13.9)

(a)



(b)

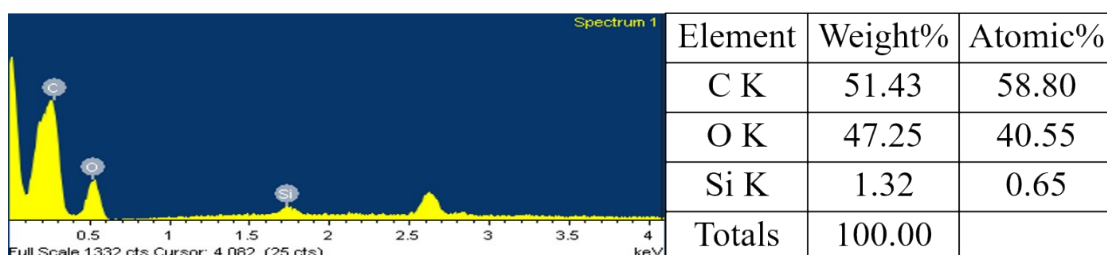


Fig. S2. EDS curves of MCC and *f*-MCC: (a) *f*-MCC with conventional agent and (b) *f*-MRPUs with ionic

liquid solution

## Thermal properties

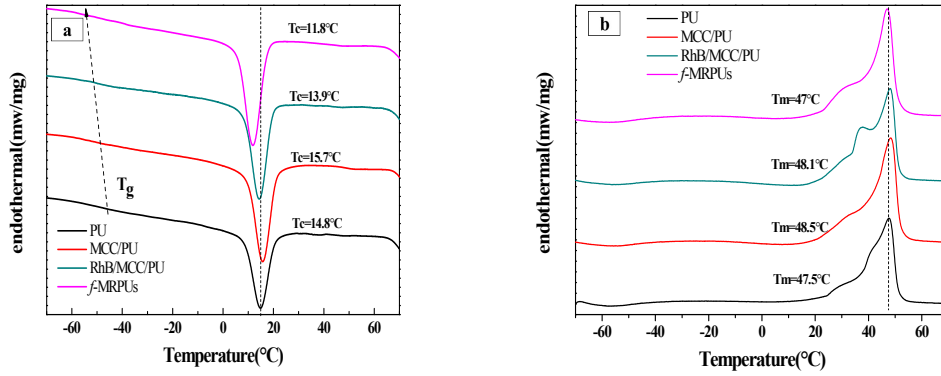


Fig. S3. DSC curves of PU composites: (a) cooling scan and (b) heating scan.

Table S2. DSC data of neat PU and PU composites

Sample	$T_g$ (°C)	$T_c$ (°C)	$\Delta H_{cc}$ (J/g)	$T_m$ (°C)	$\Delta H_m$ (J/g)
PU	-47.5	14.8	16.58	47.5	24.96
MCC/PU	-44.3	15.7	19.61	48.5	30.76
RhB/MCC/PU	-49.2	13.9	20.68	48.1	31.96
f-MRPUs	-50.6	11.8	24.66	47.0	32.82

*Before shape memory test*

*After shape memory test*

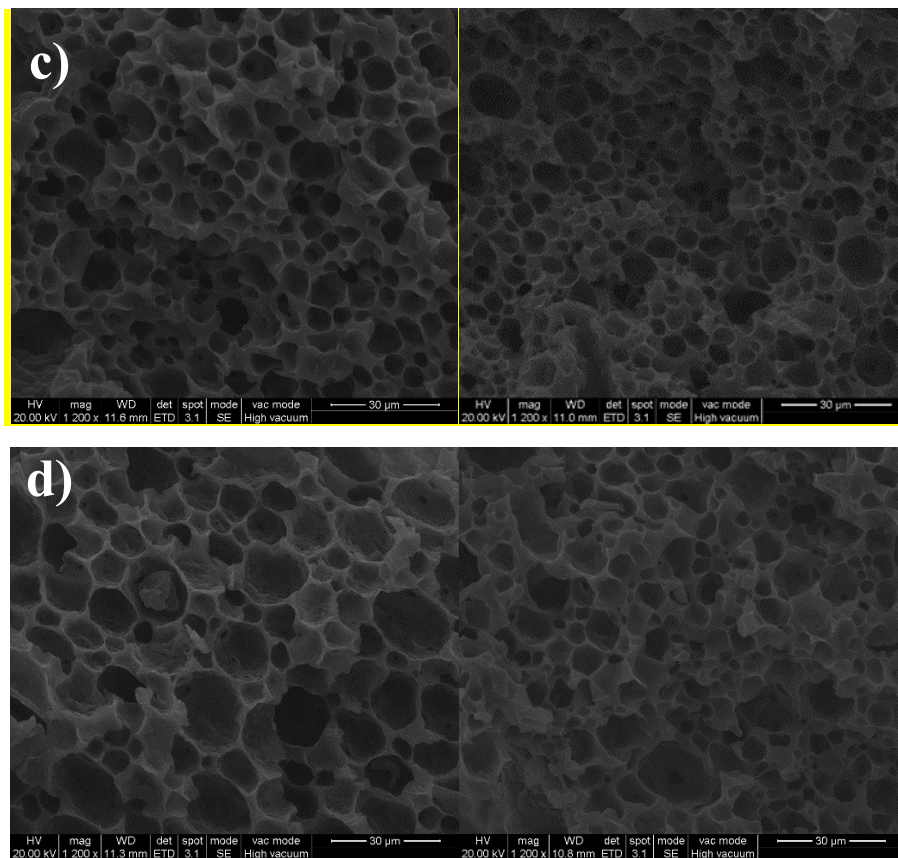


Fig S4. Morphologies of PU and its composites: (a) PU (b) MCC/PU

UV picture

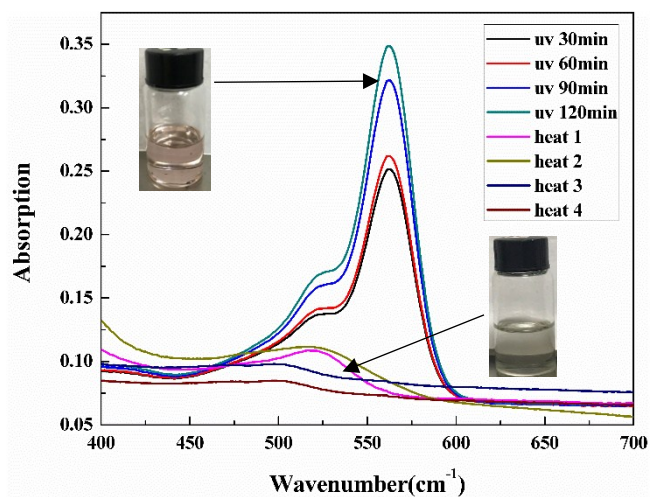
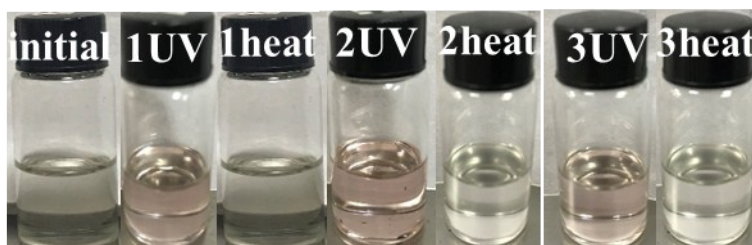


Fig. S5. UV curves of RhB/PU Film

(a) PU/RhB



(b) *f*-MRPUs

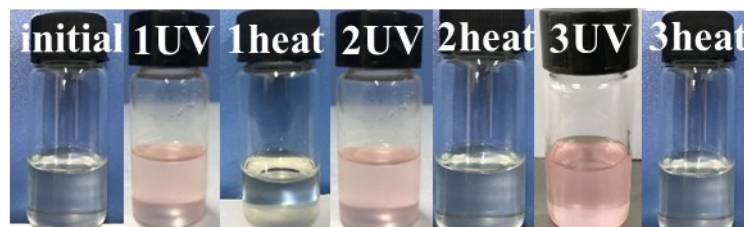


Fig. S6. UV/Heat responsive behavior of (a) RhB/PU and (b) *f*-MRPUs suspended in NMP