**Electronic Supplementary Information** 

## Highly stretchable and stretch-induced fluorescence chromism self-healing materials based on boroxine and dynamic imine bond

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Scheme S1 Synthetic route for PDMS-DPBA-5000 in the work



Scheme S2 Synthetic route for Compound 1 and 2 in the work



Figure S1 The DSC curves of PDMS-DPBA-5000



**Figure S2** Dynamic oscillatory temperature sweeps of PDMS-DPBA-5000 ranging from 25 °C to 80 °C at 1 Hz



**Figure S3** The emission spectrum of a) DPBA powder and b) compound 1 powder. The insert images show the corresponding fluorescence taken under 365 nm UV light in dark.



Figure S4 FTIR spectra of PDMS-DPBA-5000 before and after stretch



Figure S5 The photo image of compound 2 (a) in DMF solution and (b) before and after grinding under 365 nm.



Figure S6. The DSC curves of (a) PDMS-DPBA-800, (b) PDMS-DPBA-2500 and (c) PDMS-DPBA-25000



**Figure S7.**Dynamic oscillatory temperature sweeps of (a) PDMS-DPBA-800, (b) PDMS-DPBA-2500 and (c) PDMS-DPBA-25000 ranging from 25 °C to 80 °C at 1 Hz



**Figure S8** Stress-strain curves of a) PDMS-DPBA-800, b) PDMS-DPBA-25000 and c) PDMS-DPBA-25000 healed at room tempreature for different time. Sample width: 7 mm; Thickness: 1 mm; Gage length: 2 mm; Loading speed: 10 mm min<sup>-1</sup>



**Figure S9** Illustration process for the preparation of a) PDMS- DPBA-5000 film and b) printed PDMS-DPBA-5000

Note: The printed PDMS- DPBA-5000 display blue cyan luminescent color, while PDMS-DPBA-5000 film studied above display green luminescent color. We think they are two different processes (Figure S9) and the main reasons are

as follows: 1) PDMS-DPBA-5000 has excellent self-healing ability, and the printed PDMS-DPBA-5000 can self-healing together if it has a certain thickness. To avoid this situation, we got a printed pattern with quite thin thickness, which no more than 0.1mm. 2) PDMS-DPBA-5000 film was obtained by concentrating 20 ml of toluene solution, which containing 1g PDMS-DPBA-5000 (Fig. S9a). During the evaporation of solvent <sup>,</sup> PDMS-DPBA-5000 can gradually gather together to form solid film with 1mm thickness. The original solution emits blue luminescence, while with the occurrence of the aggregation process, the luminescence changes caused by aggregation are shown and the finally film display green luminescence. 3) The printed PDMS-DPBA-5000 (Fig. S9b). The printed solution can quickly volatilize to obtain solid film with a thickness no more than 0.1mm. During the evaporation of solvent, due to concentration of PDMS-DPBA-5000, the printed film tends to show luminescence in the non-stacking state, similar to the luminescent color of the stretched film. Therefore, the luminescent color of printed PDMS-DPBA-5000 are different with that of the PDMS-DPBA-5000 film.

	Healing time	Elongation	Young's modulus	Emission peak
	(at 25 °C)	(mm/mm)	(MPa)	(nm)
PDMS-DPBA-800	48 h	1.8	$75.4 \pm 3.2$	565
PDMS-DPBA-2500	4 h	5.5	$26.7\pm1.3$	538
PDMS-DPBA-5000	20 min	42	$0.63\pm0.11$	513
PDMS-DPBA-25000	80 s	150	$0.09\pm0.02$	487

Table S1. Summary of properties of PDMS-DPBA



Figure S10 <sup>1</sup>H NMR spectum of Compound 1



Figure S11 <sup>13</sup>C NMR spectum of Compound 1



Figure S12 <sup>1</sup>H NMR spectum of Compound 2



Figure S13 <sup>13</sup>C NMR spectum of Compound 2



Figure S15 <sup>13</sup>C NMR spectum of PDMS-DPBA-5000