Supplementary information

## Insights into the Mechanical Response of Spiropyran Elastomers

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Figure S1. <sup>1</sup>H NMR spectrum of SP1 (400 MHz, CDCl<sub>3</sub>).



Figure S2. Mass spectrum of SP1.





Figure S4. Mass spectrum of SP2.









**Figure S7.** Compressive stress-strain curves of (a) PDMS and SP-c1, (b) SP1-c(1-3), (c) SP2-c(1-3), (d) SP3- c(1-3) at concentration of 5.0, 9.4 and 14.1  $\mu$ mol/g.



**Figure S8**. Ratio of RGB colour channel intensities as a function of compressive strain, (a) SP1, (b) SP2, and (c) SP3, at the concentration of c1.



**Figure S9.** Optical images of SP-PDMS with different SP concentration before and after compression at a strain of 70%.



Figure S10. Absorption spectra of SP2-c1 under 56% compressive strain at different time.



**Figure S11.** Plot of absorption intensity vs relaxation time for (a) SP1-c1, (b) SP2-c1, (c) SP3-c1, and their linear fitting curves.



**Figure S12.** Plot of absorption intensity/maximum absorption intensity vs compression time at a strain of 62% in darkness for SP-c1.



**Figure S13.** Calculated energies for merocyanine (MC) isomers of SP1 (blue) and SP2 (red) model compounds, with connecting transition state energies. Energies are 0 K enthalpies at the M06-2X/6-31G(d) level of theory.