Supporting Information For

Environmental Effects on Mechanochemical Activation of Spiropyran in Linear PMMA

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Sample Geometry

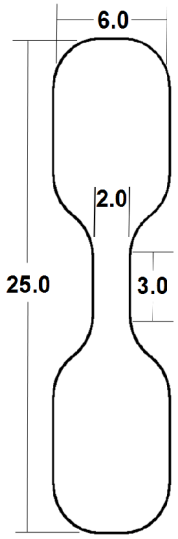

Figure S1. Sample geometry for tensile testing. Dimensions are given in mm. Samples were polished to a thickness of 0.50 mm ± 0.05 mm.

T_gDetermination

Temperature was increased at a rate of 3 °C min^{-1} for both DSC and DMA measurements. $T_g$was defined as the change in slope for DSC curves, and the maximum of the tan(δ) peak for DMA. Glass transition temperatures determined by the two methods agree well, to within about a degree in the case of active PMMA (red curves in Fig. S2). Moreover, the three DSC curves all demonstrate glass transitions over a narrow range of temperatures (126-129 °C).

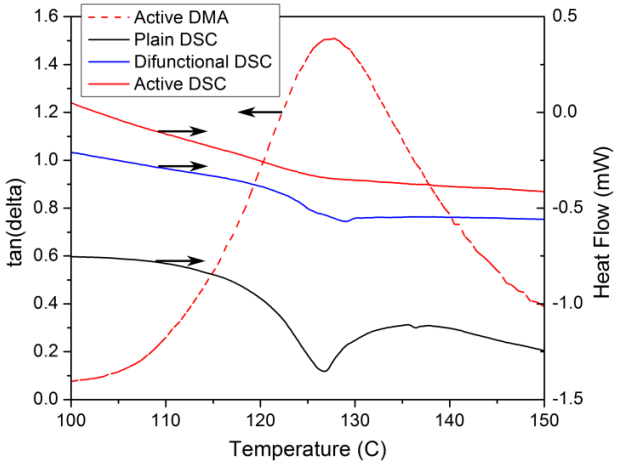

Fig. S2: DSC and DMA test results for plain, difunctionalSP-linked control, and active PMMA.

Mechanical Properties of Controls

Samples reported in Fig. S3 were tested at 90 °C by the method outlined in the main text. Comparing the stress-strain response in Fig. S3, there was no significant effect of incorporation of SP (1 SP species per ~1000-2500 monomer units) in the polymer backbone. The variation in yield stress and failure strain was comparable to the normal sample-to-sample variation in testing multiple samples of one polymer type.

Table S1: Optical images of difunctional SP-linked control PMMA samples.

As Molded	**Irradiated (530 nm Source)**	**Failed @ 90 °C**
		

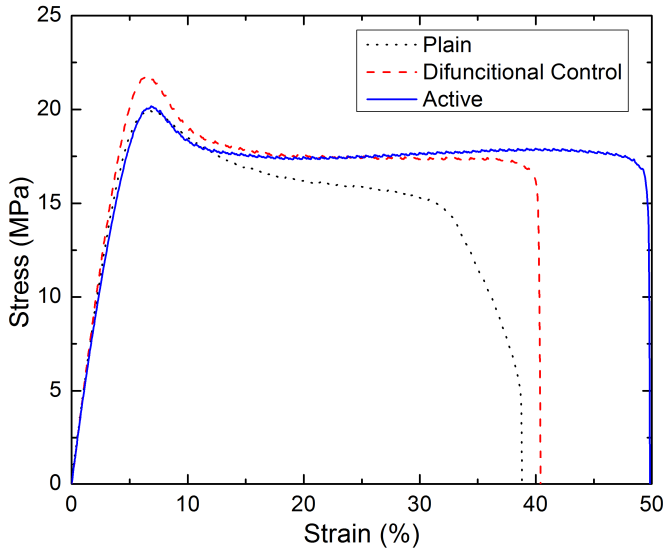

Fig. S3: Representative stress-strain curves of PMMA samples tested at 90 °C.

Fluorescence Spectra

Untested polymer was driven to the closed, SP form using 530 nm light prior to taking spectra. Mechanically activated samples were tested to tensile failure at 90 °C and cooled to room temperature before spectra were taken. The emission curves were obtained by excitation with 532 nm light. The small amount of fluorescence of the untested samples is likely due to incomplete conversion to the SP form. Difunctional SP-linked control PMMA did show SP reactivity using a strong 530 nm light source. Mechanical testing, however, did not lead to color change, in agreement with results from *in situ* fluorescence.

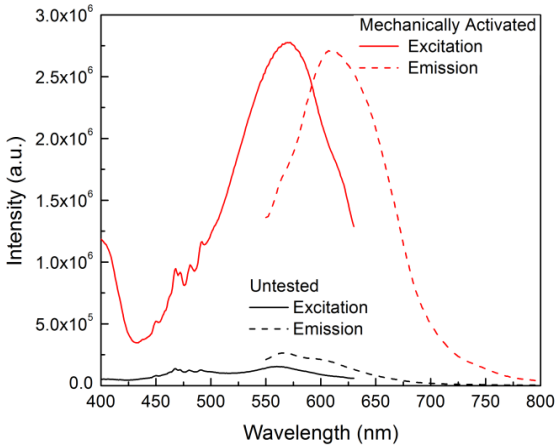

Figure S4: Fluorescence spectra of untested and mechanically activated SP-linked PMMA samples.