

Supporting Information

Soybean Oil-Based Thermoset Films and Fibers with High Biobased Carbon Content via Thiol-Ene Photopolymerization

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Characterization

Nuclear magnetic resonance (NMR) spectroscopy. One-dimensional and two-dimensional NMR spectra were recorded on Bruker Avance III HD nanobay AX-400 and Bruker Avance III 500, respectively, using CDCl₃ (Cambridge Isotope Laboratories). Chemical shifts are referenced to the solvent peaks at 7.26 ppm.

Fourier-transformed infrared (FT-IR) spectroscopy. Infrared spectra of monomer mixtures were measured using a Nicolet 6700 FT-IR spectrometer with a KBr beam splitter and a MCT-A detector (Thermo Fisher Scientific, Waltham, MA) using a scan resolution of 1 cm⁻¹. The spectrometer and horizontal transmission accessory were continuously purged with dry CO₂ free air. Samples were dropped on a polished NaCl plate (diameter: 25 mm; thickness: 4 mm), and the other NaCl plate was subsequently placed on the top of the first plate to sandwich the sample between two plates. In order to calculate acrylate conversion by UV irradiation, the intensity reduction of acrylate peak at 1,636 cm⁻¹ from the initial peak intensity was computed (*i.e.* conversion = $(I_0 - I_t)/I_0$). All intensity values were self-referenced to a photochemically stable hydroxyl peak (3,643-3,203 cm⁻¹).

Rheological measurement. Measurement of viscosities of soybean oil mixtures was performed with 25 mm parallel plate and a Peltier lower plate on Discovery Hybrid Rheometer (DHR-3, TA instruments, USA) at room temperature. Frequency sweep tests were conducted from 0.01 to 10 Hz at 0.1% strain with the fixed gap of 500 μm.

Dynamic mechanical analysis. To obtain storage modulus and tan δ curves, soybean oil based thermosets were cut into rectangular specimens with a thickness of 0.47 mm, gauge length of 21 mm, and a width of 5 mm, which were measured by a RSA-G2 solid analyzer (RSA-G2, TA Instruments, USA) equipped with a film tension clamp. The temperature was controlled by a force

convection oven attached with a liquid N₂ cooling device, and the measurement was conducted by applying a frequency of 1 Hz and a %strain of 0.03%. The specimen was cooled down to -50 °C by liquid N₂ prior to the acquisition of data, and the temperature was ramped to 150 °C at 3 °C min⁻¹.

Uniaxial tensile test. Photocured soybean oil thermosets were cut into dog-bone tensile testing specimens satisfying ASTM D1708-13 standards using a cutting die (SDMK-1000-D, Dumbbell Co., Ltd.) with an average thickness of 0.47 mm, gauge length of 22 mm, and width of 5 mm. Uniaxial tensile tests were performed on a Shimadzu Autograph AGSS17 X Series tensile tester (Columbia, MD) with a cross-head velocity of 1 mm min⁻¹. Reported values represent an average over at least seven measurements.

Field-emission scanning electron microcopy (FE-SEM). The fiber samples placed on an Al foil collector was sputter-coated (~ 2 nm) from Ir target to deposit a charge dissipation layer on the fiber surface. The sample was then loaded into a Hitachi SU8230 SEM operated with 1 kV accelerating voltage, a working distance of 6.1 mm, and a secondary electron detector. The diameter distribution of 131 fibers was obtained from the analysis on the FE-SEM images using ImageJ software.

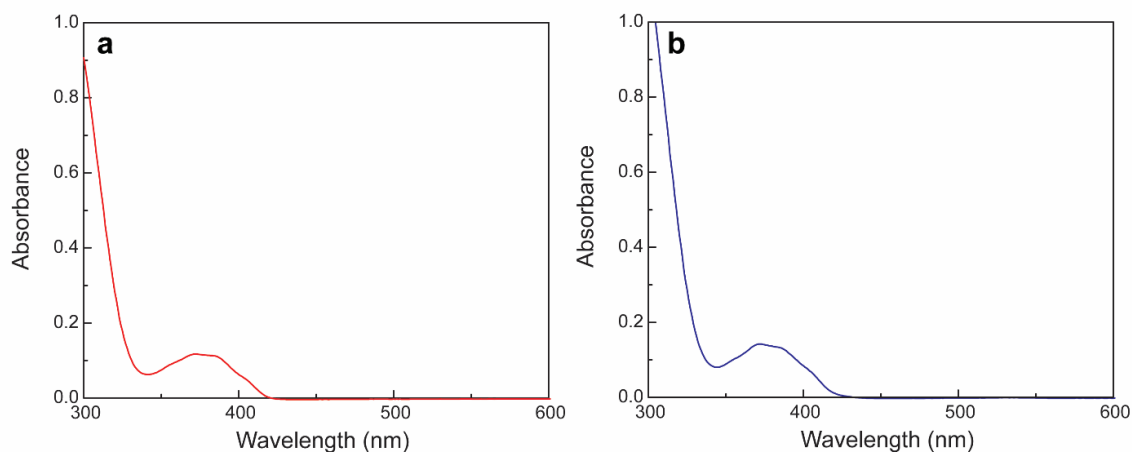


Figure S1. UV-visible absorption spectra of 2.00×10^{-2} wt% solutions of (a) EPP and (b) Omnirad 2100 in ethyl acetate.

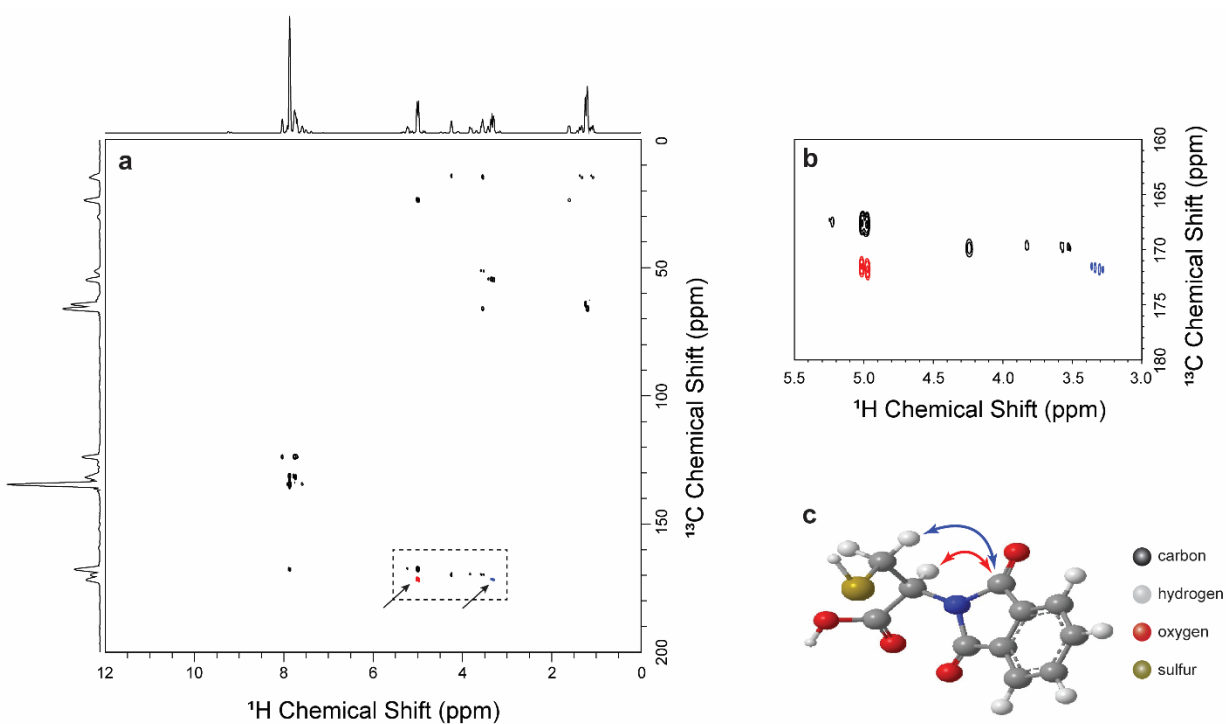


Figure S2. (a) ^1H - ^{13}C heteronuclear multiple-bond correlation (HMBC) spectrum of the resulting mixture (*N*-phthaloyl-L-cysteine and ethyl carbamate); (b) magnified spectrum of dashed box in (a); (c) the ball-and-stick model of *N*-phthaloyl-L-cysteine and couplings between cysteine protons and carbonyl carbon in the phthalimide moiety detected in (a) and (b).

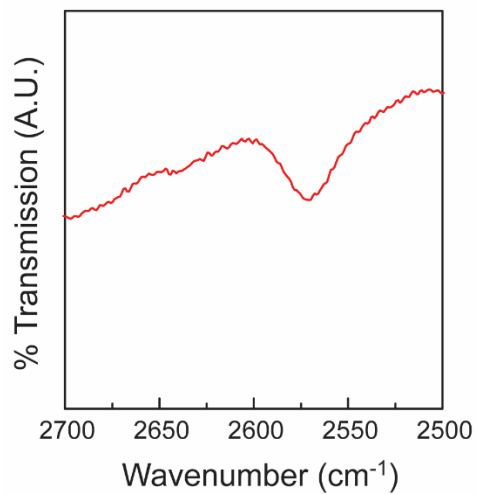


Figure S3. FT-IR spectrum of MESO at the region of 2500–2700 cm⁻¹.

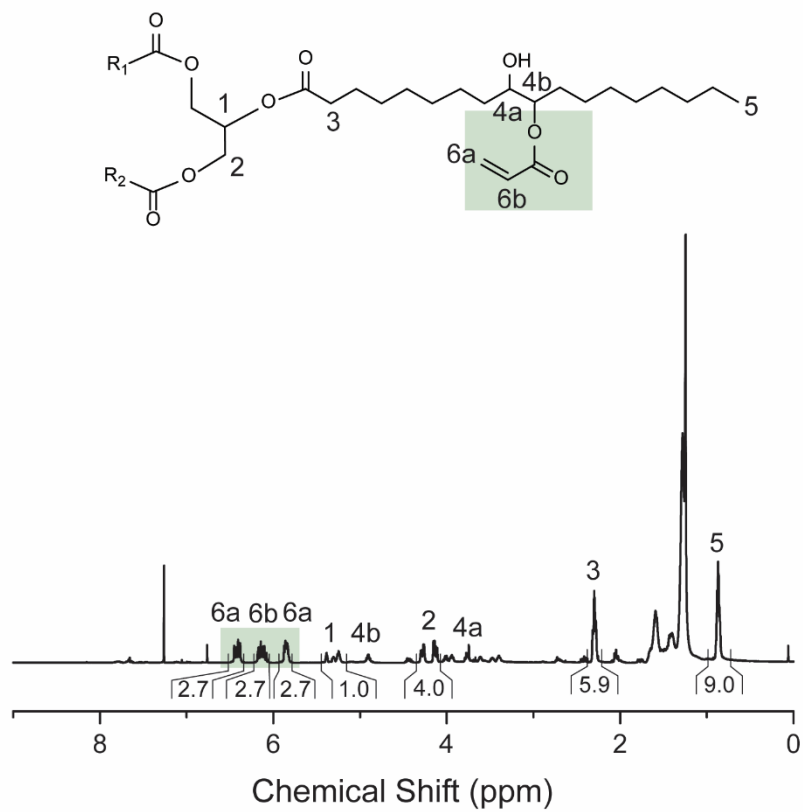


Figure S4. ¹H-NMR spectrum of AESO.

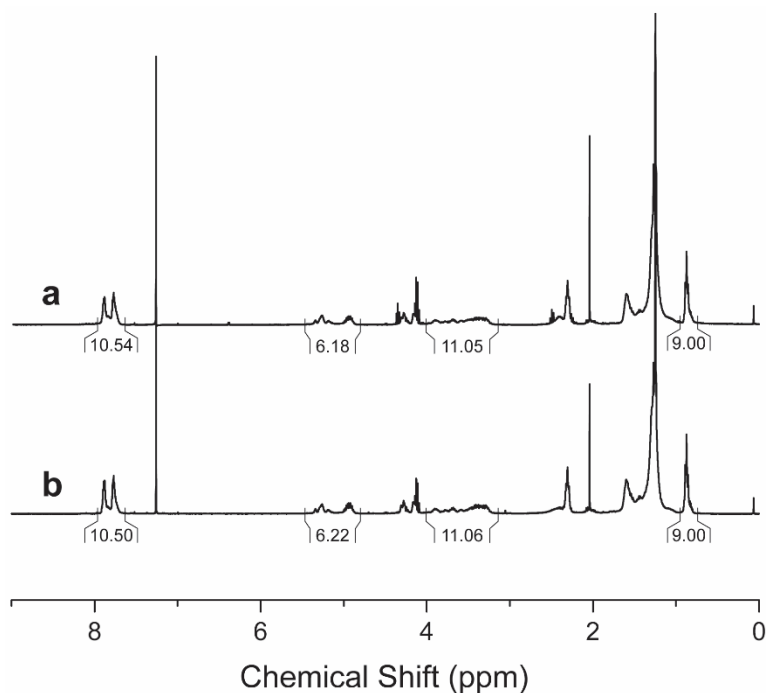


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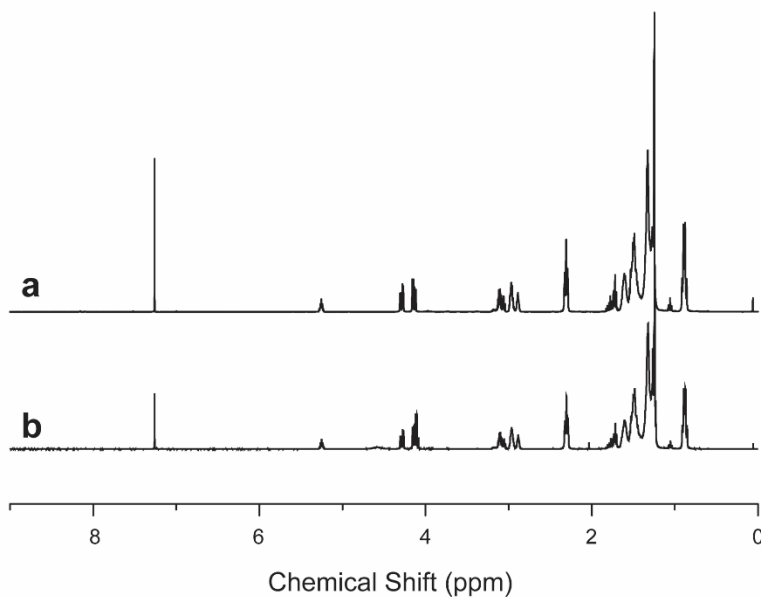


Figure S6. NMR spectra of ESO: (a) before and (b) after heating with ethyl carbamate under reflux for 24 h.

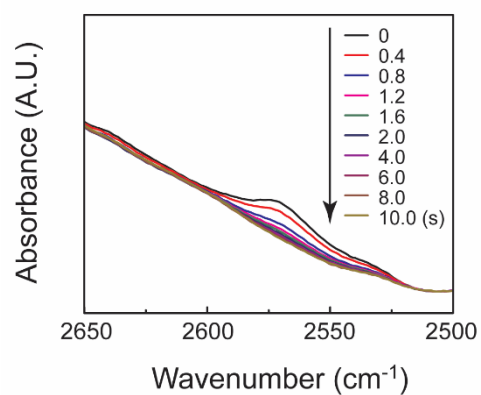


Figure S7. FT-IR spectrum of MESO in the region of 2500–2650 cm^{-1} .

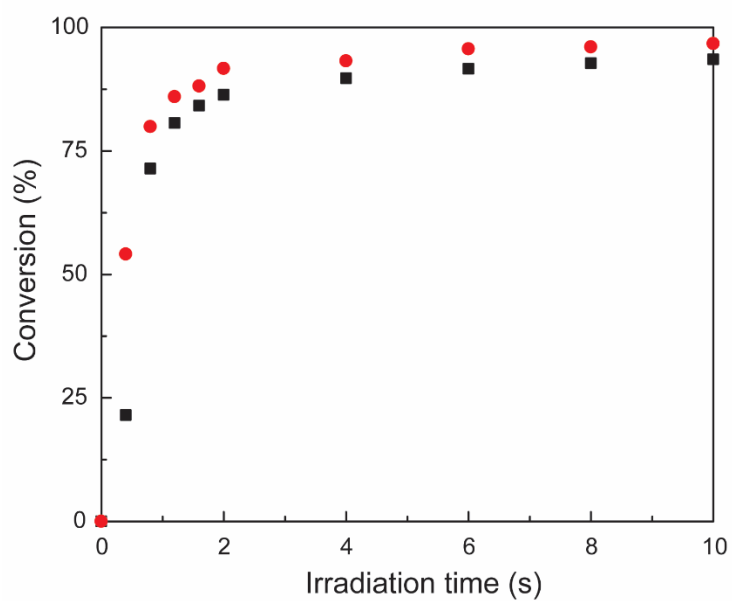


Figure S8. Photoconversion of C=C groups in the acrylate for an AESO-only mixture (black) and AESO/MESO mixture (red) under UV irradiation (58 mW/cm^2).

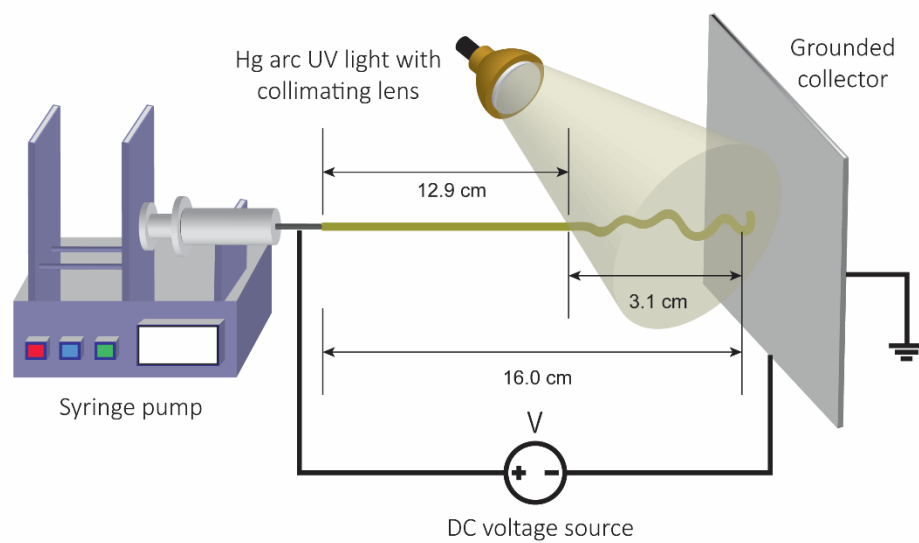


Figure S9. Schematic illustration of the electrospinning setup used in this study.