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Supporting Information for

Pressure-Sensitive Adhesives Based on Soybean Fatty Acids

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Supporting Experimental Section

Estimation of the fatty acid distribution in the epoxidized fatty acids (EFAs) mixture and epoxidized soybean oil (ESO)

Distinct peaks of the methine protons of the *cis*-epoxy groups from epoxidized oleic acid (EOA, *cis*-9,10-epoxystearic acid) at 2.86-2.95 ppm[1] and those from linoleic acid *di*-epoxide (LADE, *cis*-9,10-*cis*-12,13-diepoxystearic acid) at 2.95-3.20 ppm[1] could be clearly identified in the ^1H NMR spectrum of the EFAs mixture or ESO. The characteristic peaks of the methine protons of the epoxy groups from epoxidized linolenic acids (a mixture of *tri*-, *di*-, and *mono*epoxides) were supposed to appear at around 2.8-3.1 ppm[1], but were hidden inside the strong peaks associated with LADE and EOA. The molar percentage of EOA, LADE and other fatty acids without any epoxy groups was estimated based on the ^1H NMR data by equations S1, S2 and S3, respectively.

$$\text{Molar percentage of EOA} = 100/[b\times(2a+1)] \quad \text{(S1)}$$
$$\text{Molar percentage of LADE} = 100a/[b\times(2a+1)] \quad \text{(S2)}$$
$$\text{Molar percentage of other fatty acids without any epoxy groups} = 100\times[b\times(2a+1) - a - 1]/[\,b\times(2a+1)] \quad \text{(S3)}$$

wherein, $a = A_3/(2A_2)$ (the molar ratio of LADE to EOA), $b = A_1/(A_2 + A_3)$ (the molar ratio of the carboxylic acid group (-COOH) to the epoxy groups); and A_1 is the peak area at 2.3-2.4 ppm due to the CH_2 α to the carbonyl of –COOH or ester groups, A_2 is the peak area at 2.86-2.95 ppm, A_3 is the peak area at 2.95-3.20 ppm, respectively, in the ^1H NMR spectrum.

Solubility test of the gel obtained from the polymerization of the EFAs mixture in the presence of AMC-2

A typical procedure with ethyl acetate as the solvent was described as follows. The gel (1.53 g) was cut into small pellets and placed in a 50-mL, round-bottom flask equipped with a magnetic stirrer. Ethyl acetate (18 mL) was then added to the flask. The resulting mixture in the flask was stirred at 300 rpm at room temperature for 3 days. After filtration, the remaining undissolved part was dried (in an oven at 103 °C for 6 h) and weighed to be about 0.80 g, (*i.e.*, ~ 52 wt% relative to the gel).

Supporting Figures

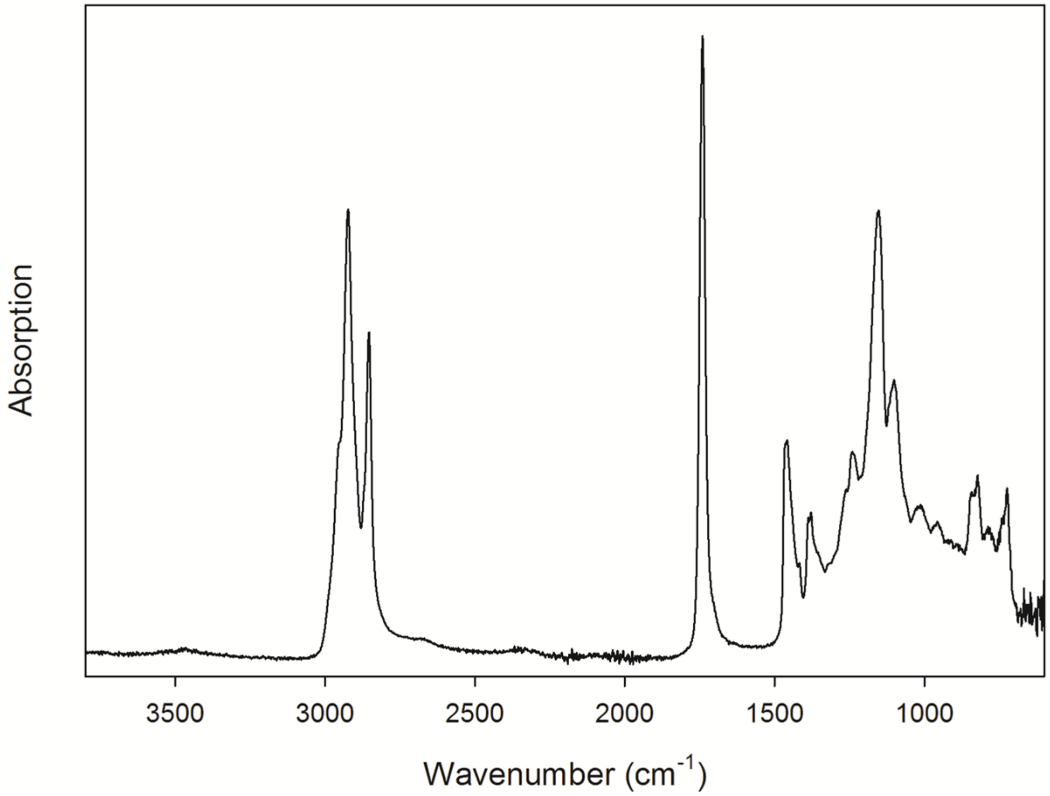

Fig. S1. FTIR spectrum of ESO obtained from Spectrum Chemical Manufacturing Corp. (New Brunswick, NJ).

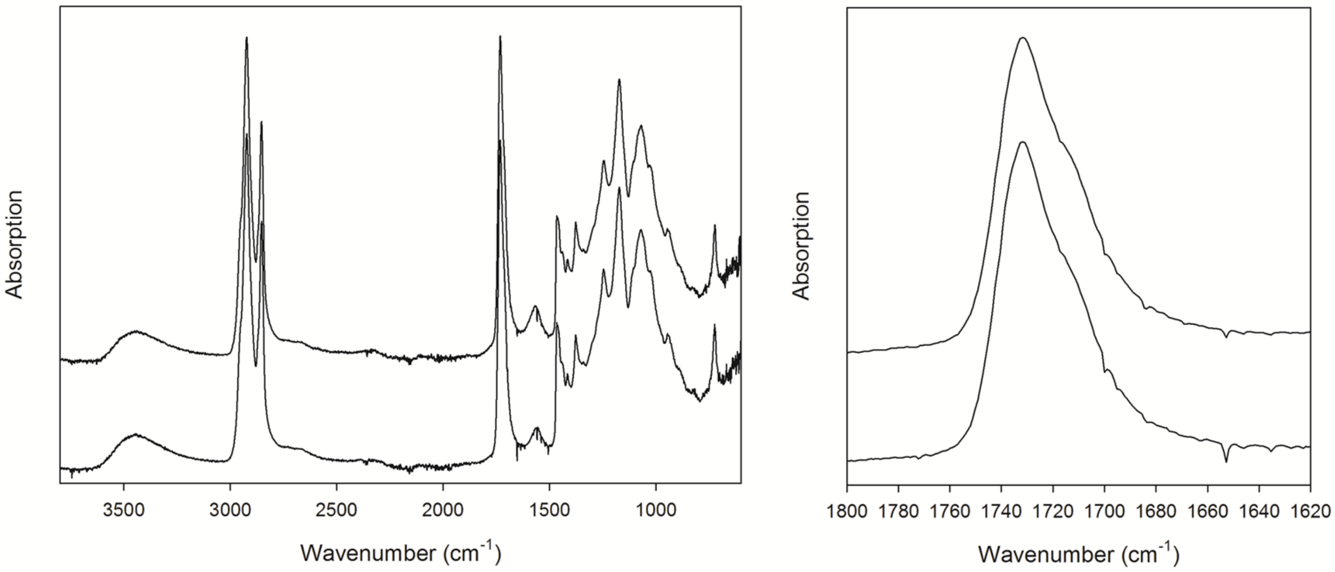

Fig. S2. FTIR spectra of the cured polymeric product by the polymerization of the EFAs mixture in the presence of AMC-2 (~1.6 wt% relative to the EFAs mixture) for a curing time of 15 min (left, bottom) and 75 min (left, top), respectively, and related close-up views (right) of the characteristic absorption signal due to the ester carbonyl stretching and the shoulder peak due to the -COOH carbonyl stretching which appeared on the right side of the ester carbonyl peak.

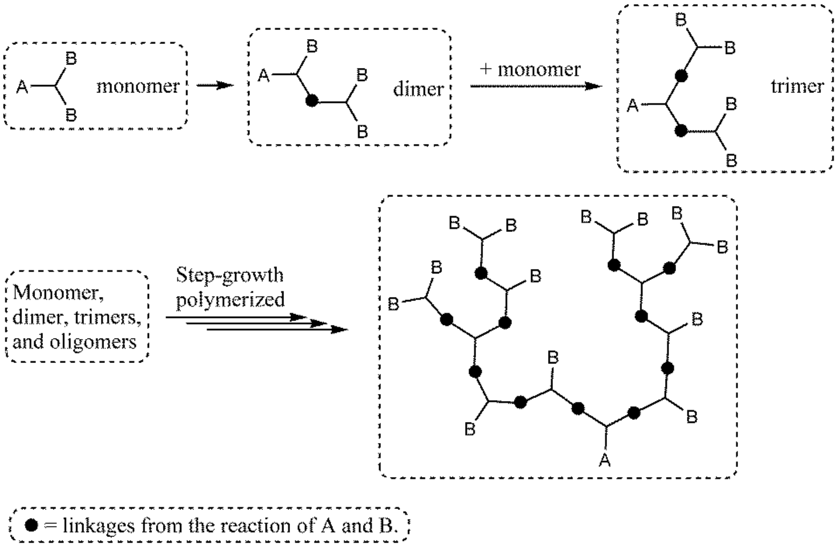

Fig. S3. Schematic representation of the synthesis of highly branched polymers from monomer AB_2 (here, the functional group A and B are –COOH and epoxy groups, respectively).

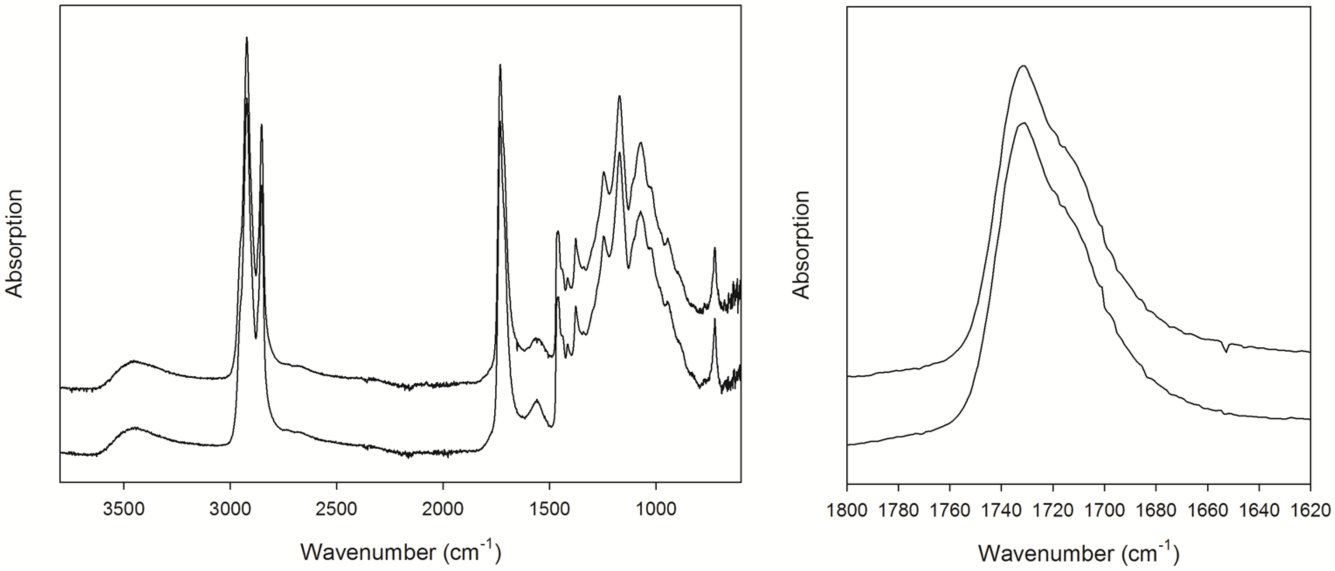

Fig. S4. FTIR spectra of the cured polymeric product by the copolymerization of EFAs mixture and dimer acid (6.0 mol-% relative to the epoxy groups) in the presence of AMC-2 (~1.6 wt% relative to the reaction mixture) for a curing time of 8 min (left, top) and 75 min (left, bottom), respectively, and related close-up views (right) of the characteristic absorption signal due to the ester carbonyl stretching and the shoulder peak due to the -COOH carbonyl stretching which appeared on the right side of the ester carbonyl peak.

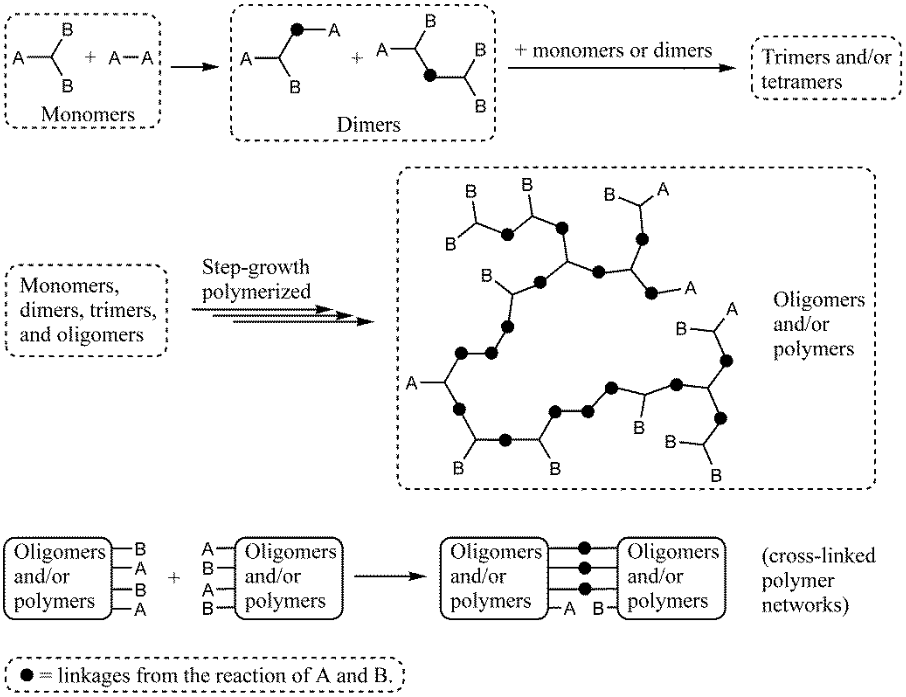

Fig. S5. Schematic representation of the synthesis of highly branched polymers from monomers AB_2 and A_2 (here, the functional group A and B are –COOH and epoxy groups, respectively, and the total amount of the –COOH groups is not greater than that of the epoxy groups in the feed).

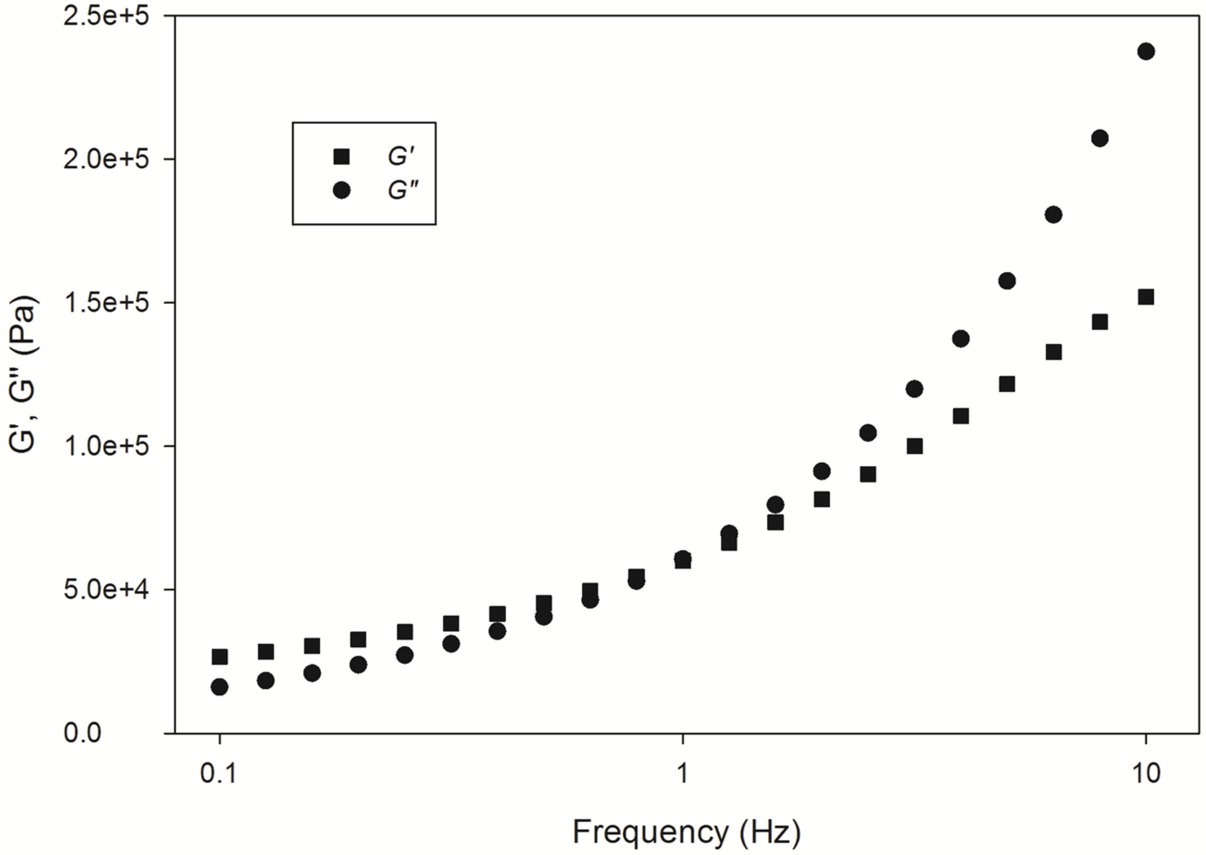

Fig. S6. Rheological profile (*G*' and *G'* vs frequency) for the EFAs-based PSA obtained from the copolymerization of the EFAs mixture and DA.

References

1 B. K. Sharma, K. M. Doll and S. Z. Erhan, *Green Chem.*, 2007, **9**, 469–474.