Electronic Supplementary Information (ESI)

High-purity monomer recovery from commercial engineering plastics by vacuum pyrolysis depolymerization

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Content:

1. Experimental

1-1. Vacuum pyrolysis of PS beads

PS beads (0.306 g) were placed in a 100-mL Pyrex test tube and heated under vacuum for 20 min using a spirit lamp flame. A liquid product (0.209 g) was collected in the trap. The product was purged with nitrogen, allowed to return to room temperature, and then subjected to GC and ^{1}H NMR analysis to determine its purity and composition. The residue (0.083 g) remained in the tube.

1-2. Vacuum pyrolysis of AS resin dripper

Small pieces (1.232 g) of the AS resin dripper, which had been crushed, were placed in a 100-mL Pyrex test tube and heated under vacuum for 20 min using a spirit lamp flame. A liquid product (0.396 g) was collected in the trap. The product was purged with nitrogen, allowed to return to room temperature, and then subjected to GC and ^{1}H NMR analysis to determine its purity and composition. The residue (0.606 g) remained in the tube.

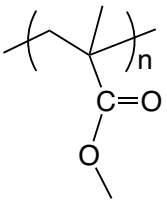
1-3. Vacuum pyrolysis of ABS resin rod

The ABS resin rod was cut into small pieces (1.423 g), each approximately 5 mm in length, placed in a 100-mL Pyrex test tube, and heated under vacuum for 20 min using a spirit lamp flame. A liquid product (0.407 g) was collected in the trap. The product was purged with nitrogen, allowed to return to room temperature, and then subjected to GC and ^{1}H NMR analysis to determine its purity and composition. The residue (0.524 g) remained in the tube.

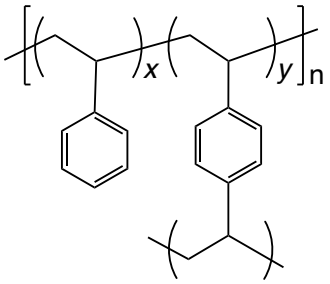
2. Figures

Fig. S1. Photographic images of the PMMA sheet, PS beads, AS resin dripper and ABS resin rod used in this study.

PMMA sheet

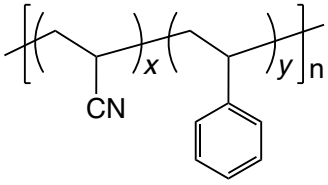


PS beads



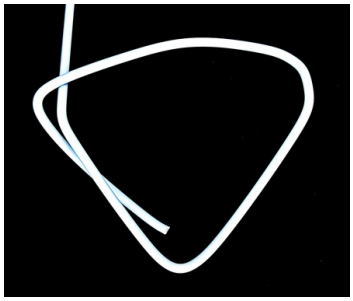
x/*y* = 0.990/0.010

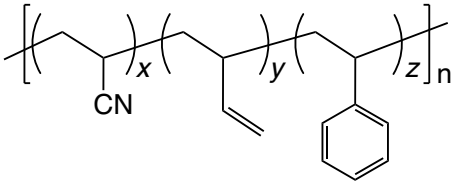
AS resin dripper



x/*y* = 0.354/0.646

ABS resin rod





x/*y*/*z* = 0.253/0.383/0.364

Fig. S2. ^{1}H NMR spectrum of the PMMA sheet. Solvent: $CDCl_3$

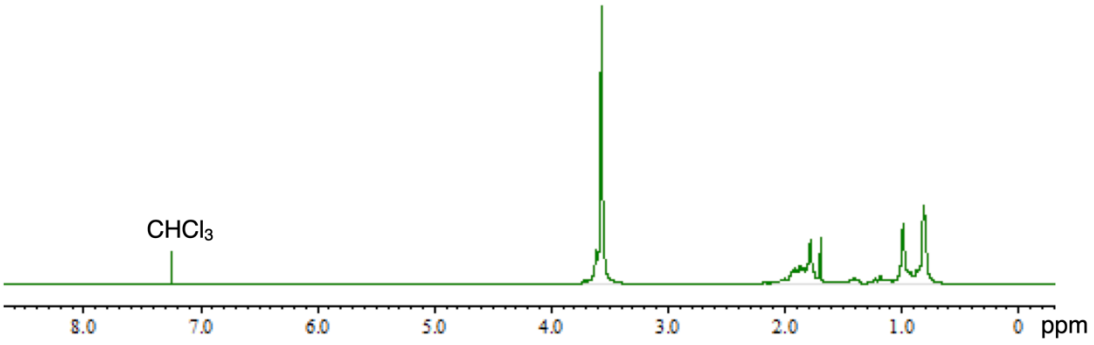


Fig. S3. ^{1}H NMR spectrum of the AS resin dripper. Solvent: DMSO-d_6. *Indicates impurity in DMSO-d_6.

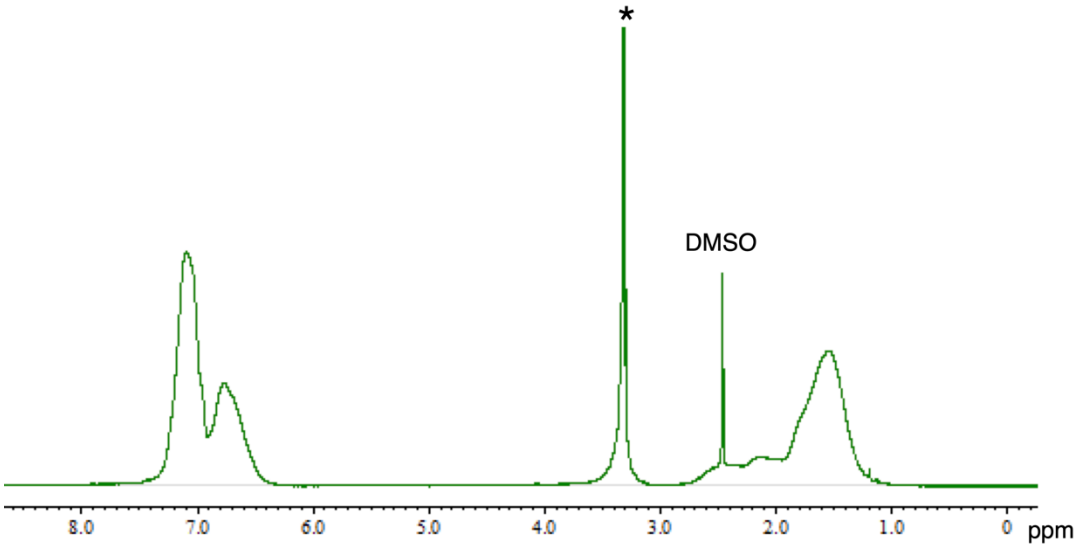


Fig. S4. Schematic illustration of the vacuum pyrolysis process.