Supplementary Information

Unprecedented enhancement of wear resistance for epoxy-resin graphene composites

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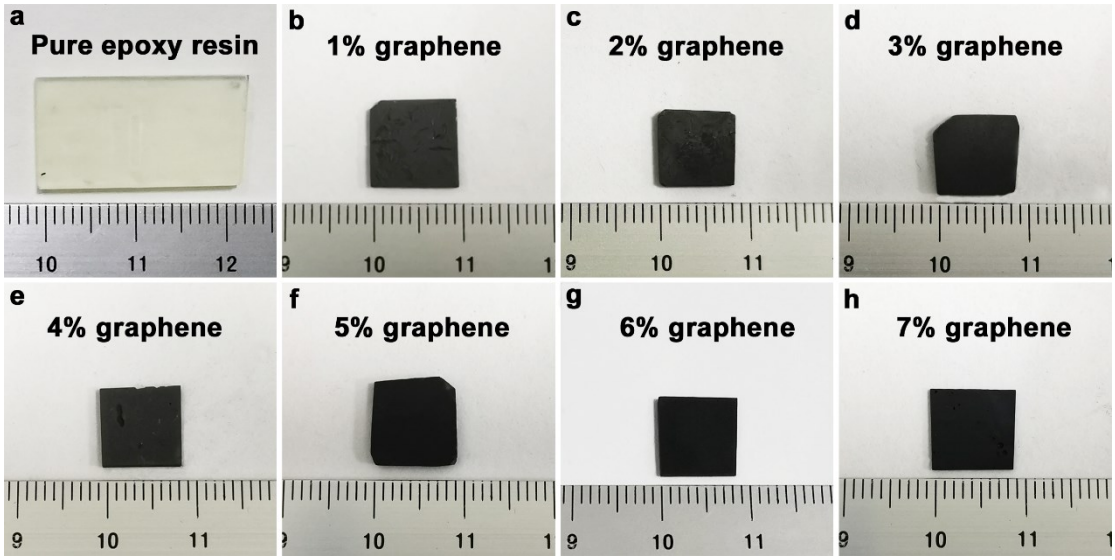

Figure S1 Photographs of prepared (a) pure ER, (b) EC1, (c) EC2, (d) EC3, (e) EC4, (f) EC5, (g) EC6, and (h) EC7.

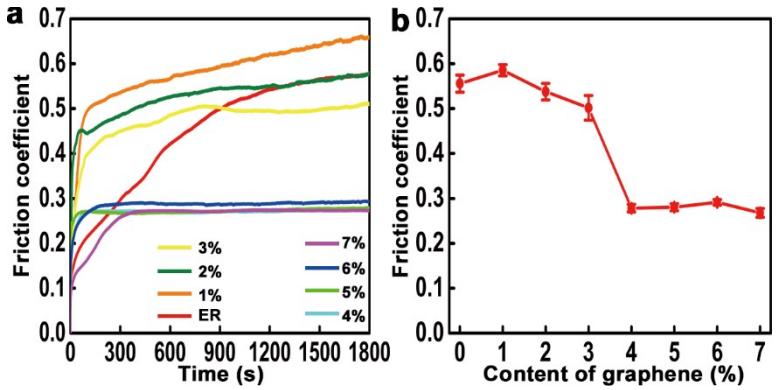

Figure S2 Friction coefficient of pure ER and ECs at 8 N as a function of (a) time and (b) content of graphene.

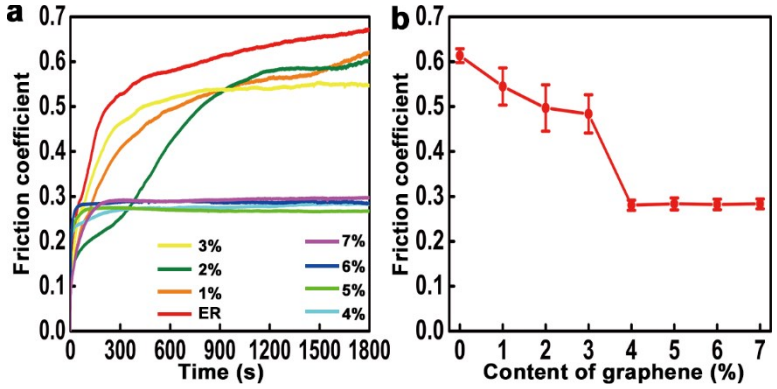

Figure S3 Friction coefficient of pure ER and ECs at 6 N as a function of (a) time and (b) content of graphene.

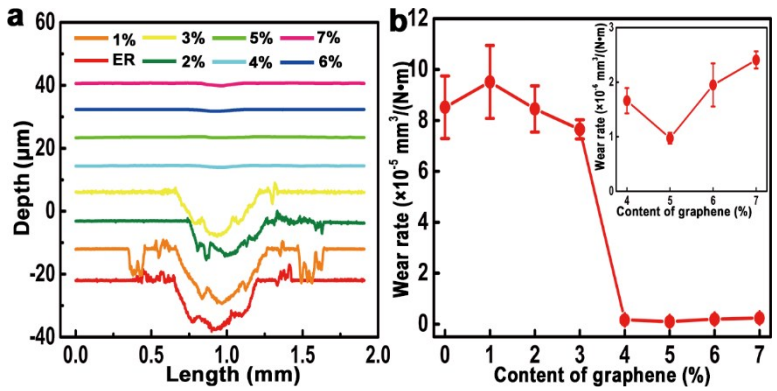

Figure S4 (a) Depth profile of wear tracks, and (b) wear rate at 8 N as a function of content of graphene for pure ER and ECs. Inset in (b) showing the corresponding enlarged part of wear rate as a function of content of graphene from 4 to 7 wt.%.

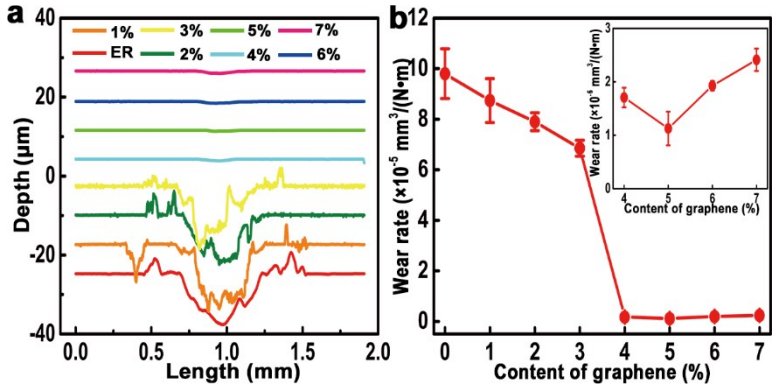

Figure S5 (a) Depth profile of wear tracks, and (b) wear rate at 6 N as a function of content of graphene for pure ER and ECs. Inset in (b) showing the corresponding enlarged part of wear rate as a function of content of graphene from 4 to 7 wt.%.

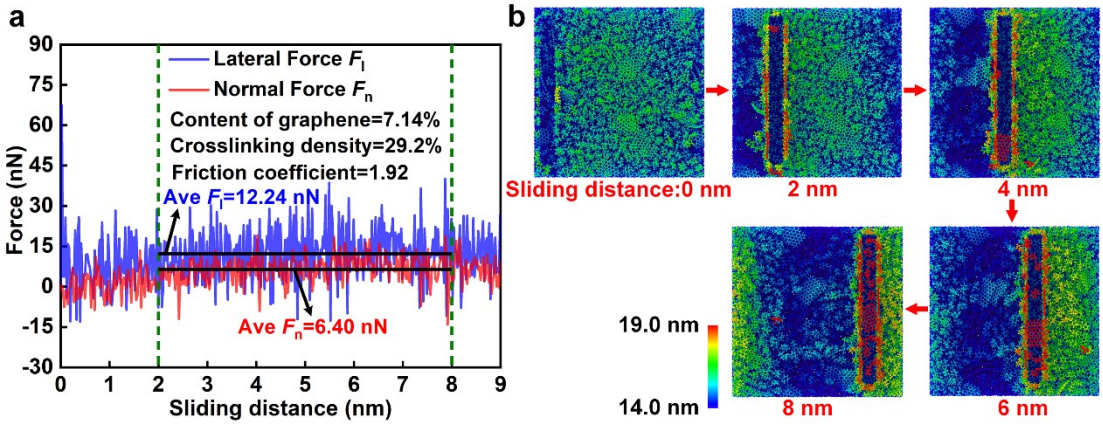

Figure S6 (a) Force curves as a function of sliding distance, and (b) their snapshots at different sliding distances for EC7.14. Atoms are colored according to their values of z coordinates.

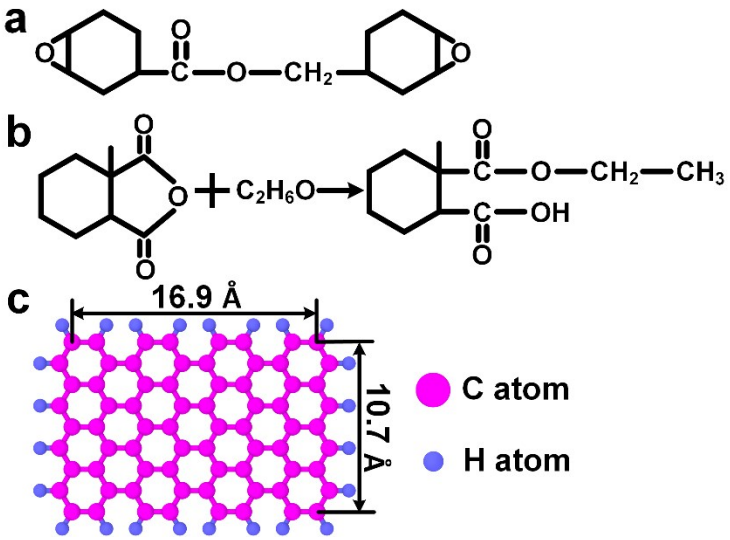

Figure S7 Molecular structure of (a) an ER monomer, (b) transition formula reacted between the curing agent and alcohol, and (c) hydrogenated graphene by H atoms at the edges.

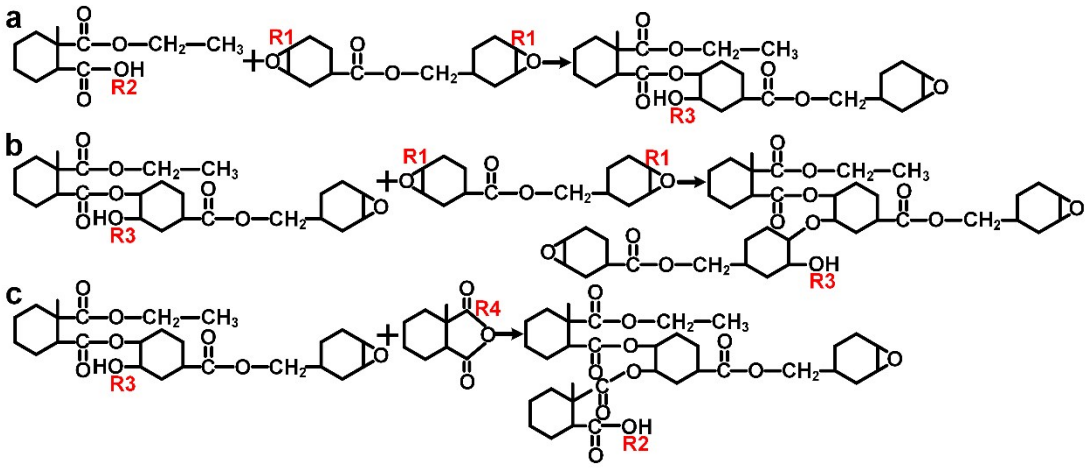

Figure S8 Reaction formulas between (a) ER and carboxylic acid, (b) between ER and hydroxyl, and (c) between hydroxyl in ER and anhydride during curing process. R1 denoting the C atoms in -CH_2- of ER, R2 standing for the oxygen (O) atoms in hydroxyl of transition molecules reacted between the curing agent and alcohol, and their resultant carboxyl groups, R3 meaning the O atoms in hydroxyl produced, and R4 representing the C atoms in anhydrate of monomer molecules in the curing agent.

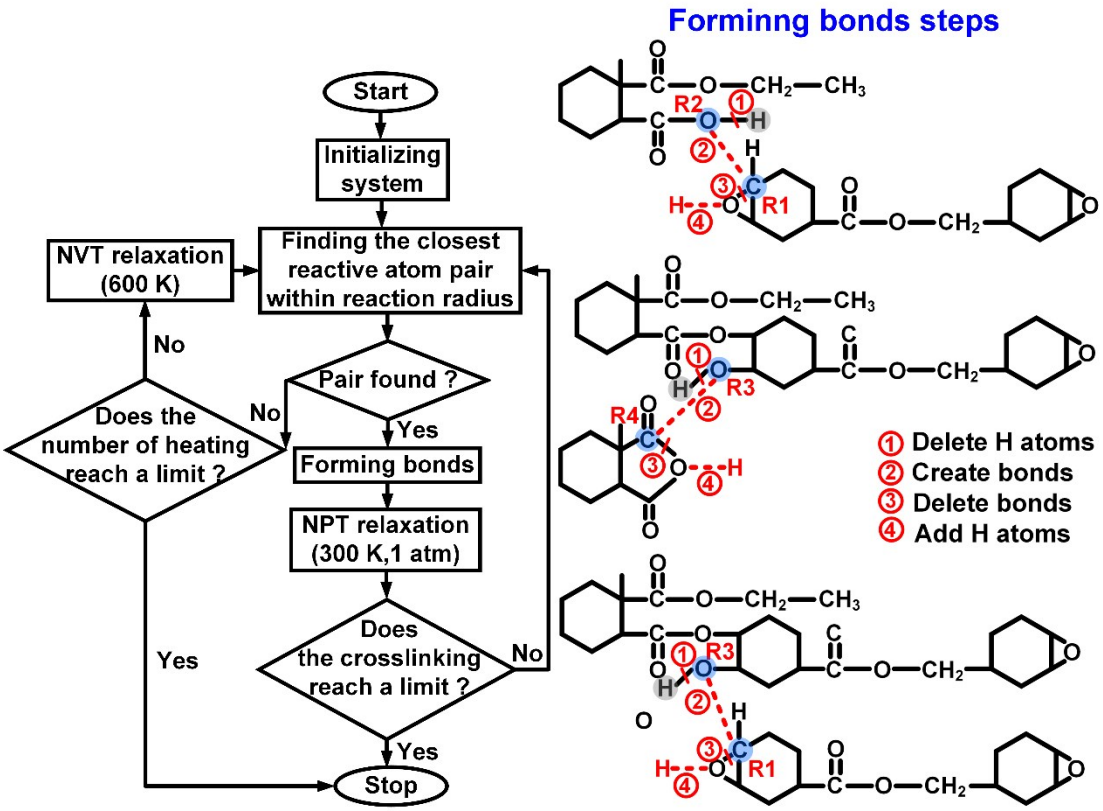

Figure S9 Flowchart of crosslinking for ER.

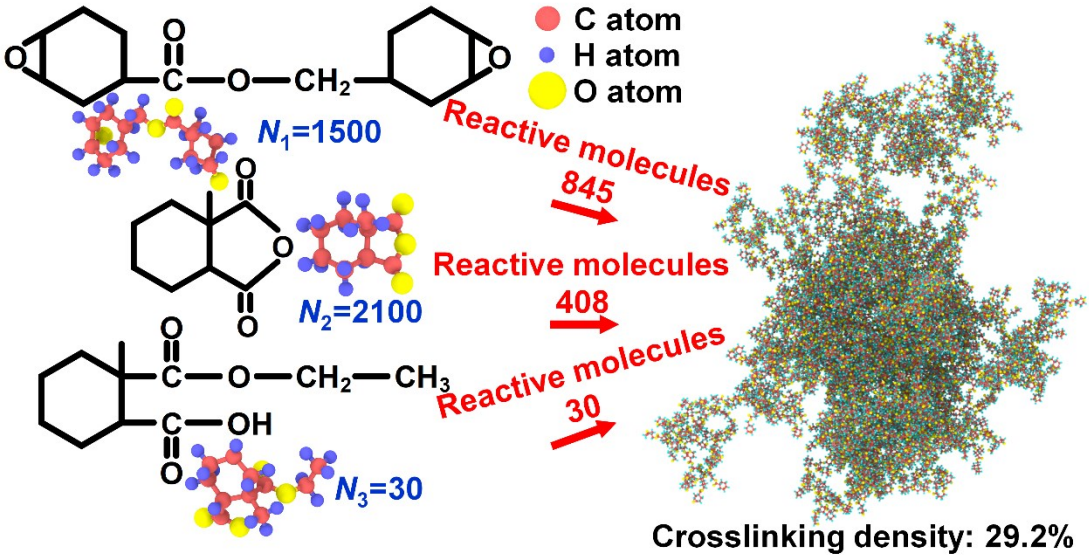

Figure S10 Molecular structure of an MD model for ER with a crosslinking density of 29.2%.

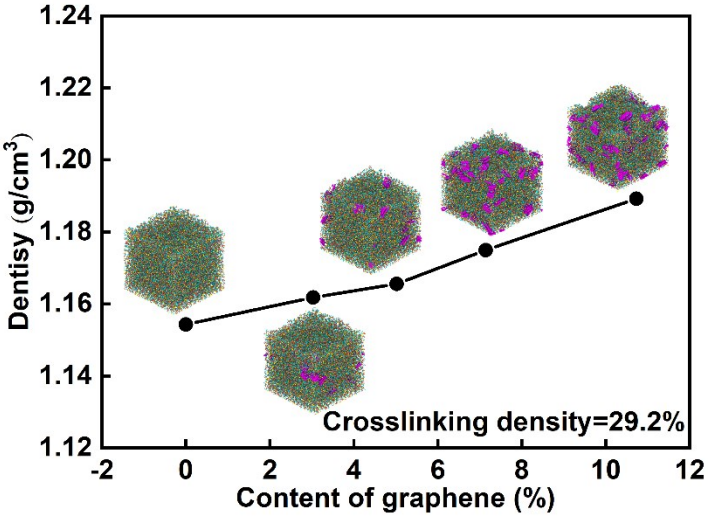

Figure S11 Density of ECs as a function of content of graphene. Purple color denoting the graphene flakes.