Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplemental Material

Mechanical Response and Microscopic Deformation Mechanism of Graphene Foams Tuned by Long Carbon Nanotubes and Short Crosslinkers

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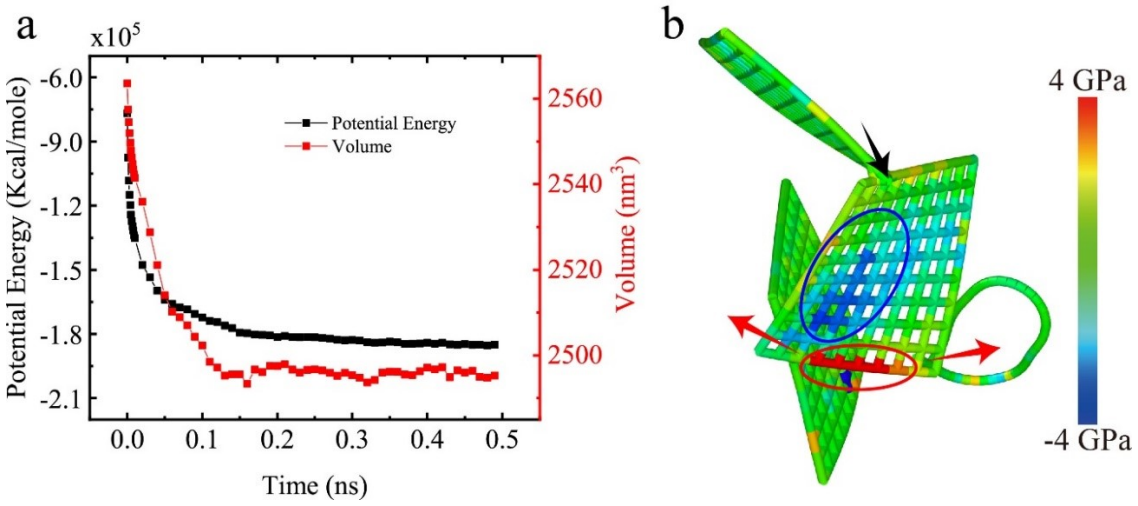

Figure S1. The relaxation of the numerical model. (a) The potential energy and volume as a function of time. (b) The snapshot of the local structure after relaxation.

The numerical model is fully relaxed before stretching and compression, the potential energy and volume of the system as a function of time during relaxation are shown in Figure S1a, both of which tend to be stable values at about 0.5 ns. To fully relax the numerical model, enough relaxation time of about 0.5 ns is applied in all simulations.

Although the model is sufficiently relaxed, the stress is still not completely removed, the reason behind it can be explained by the typical snapshot of the local structure shown in Figure S1b, after the relaxation, the graphene sheet may be still dragged (red arrows) and extruded (black arrow) by other graphene sheets and CNTs, resulting in residual stress inside the structure.

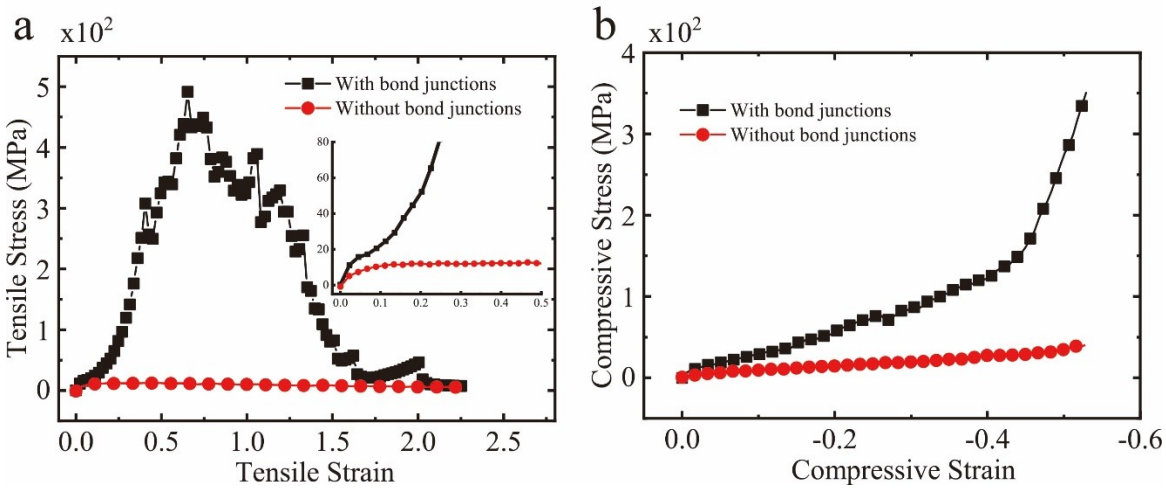

Figure S2. The effect of bond junctions. (a) Tensile stress-strain curves of graphene/CNT composite foams with and without bond junctions; (b) Compressive stress-strain curves of graphene/CNT composite foams with and without bond junctions.

In the main text, the CbGrF contains plenty of bond junctions, the bond junctions linked the adjacent graphene sheets, adjacent CNT chains, and adjacent graphene sheets and CNT chains, resulting in excellent tensile and compressive properties. If all the bond junctions are deleted, the graphene sheets and CNT chains only connect through weak van der Walls force, as shown in Figure S2, short bond and long CNT crosslinker are not exist, and both tensile and compressive stress is significantly lower than that of CbGrF.