

Supplemental Material for
**“Mechanisms of Interlayer Friction in low-
dimensional homogeneous thin-wall Shell Structure
and Its Strain Effect”**

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This supporting information contains the following sections:

1. Results of interlayer friction for DWCNTs combinations of other \bar{r}
2. Phonon spectra

1 Results of interlayer friction for DWCNTs chiral combinations of other \bar{r}

The results of other groups DWCNTs are depicted in Figure S1 and Figure S2. It shows similar to the result of the DWCNTs groups of between 7.70–7.84 Å and.

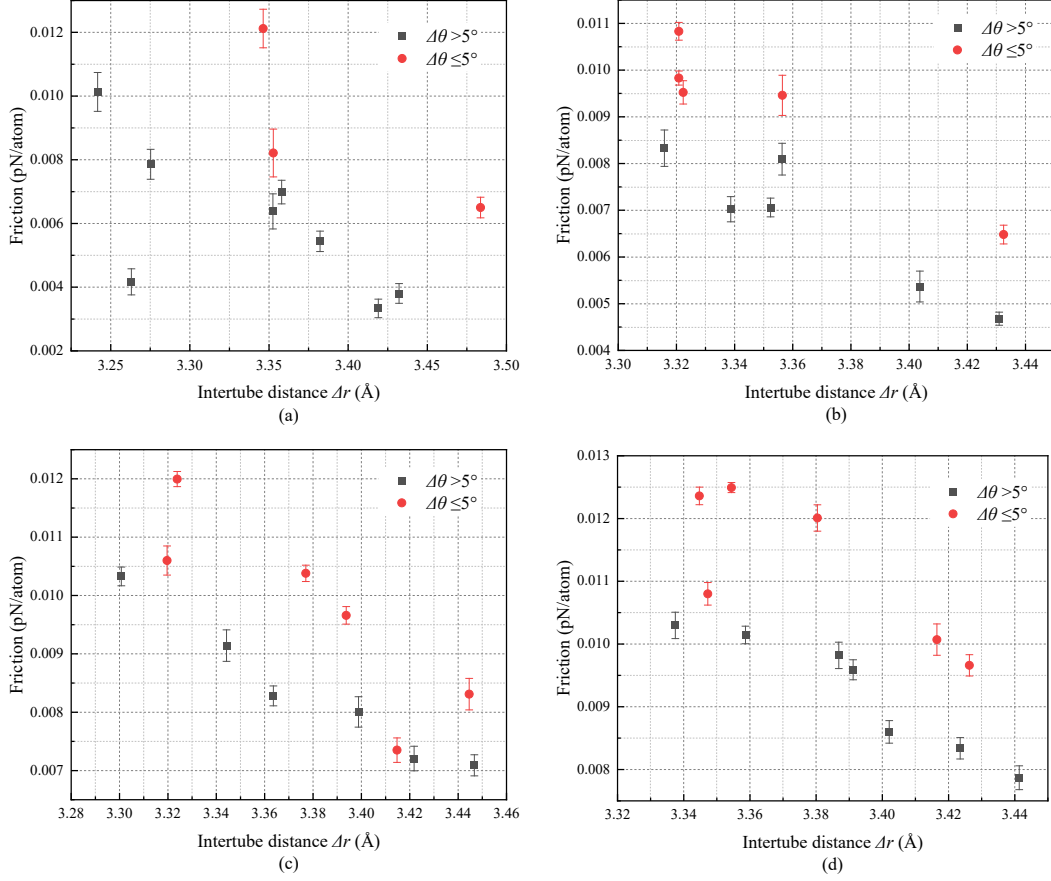
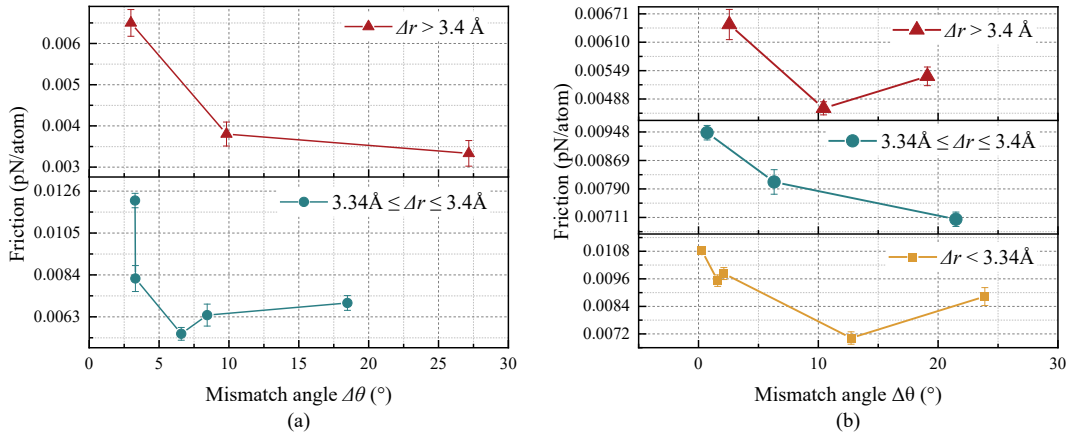


Fig. S1 The variation of interlayer friction which correspond to DWCNTs of different chiral combinations with the distinction of Δr for DWCNTs with $\Delta\theta > 5^\circ$ and $\Delta\theta \leq 5^\circ$. The \bar{r} is set between (a) 5.00–5.20 Å. (b) 7.45–7.55 Å. (c) 8.32–8.41 Å. (d) 9.00–9.07 Å.



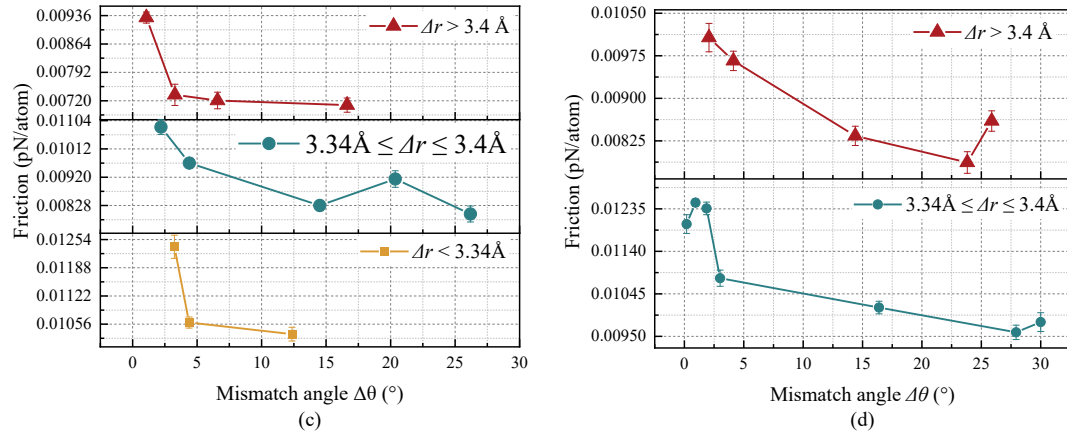
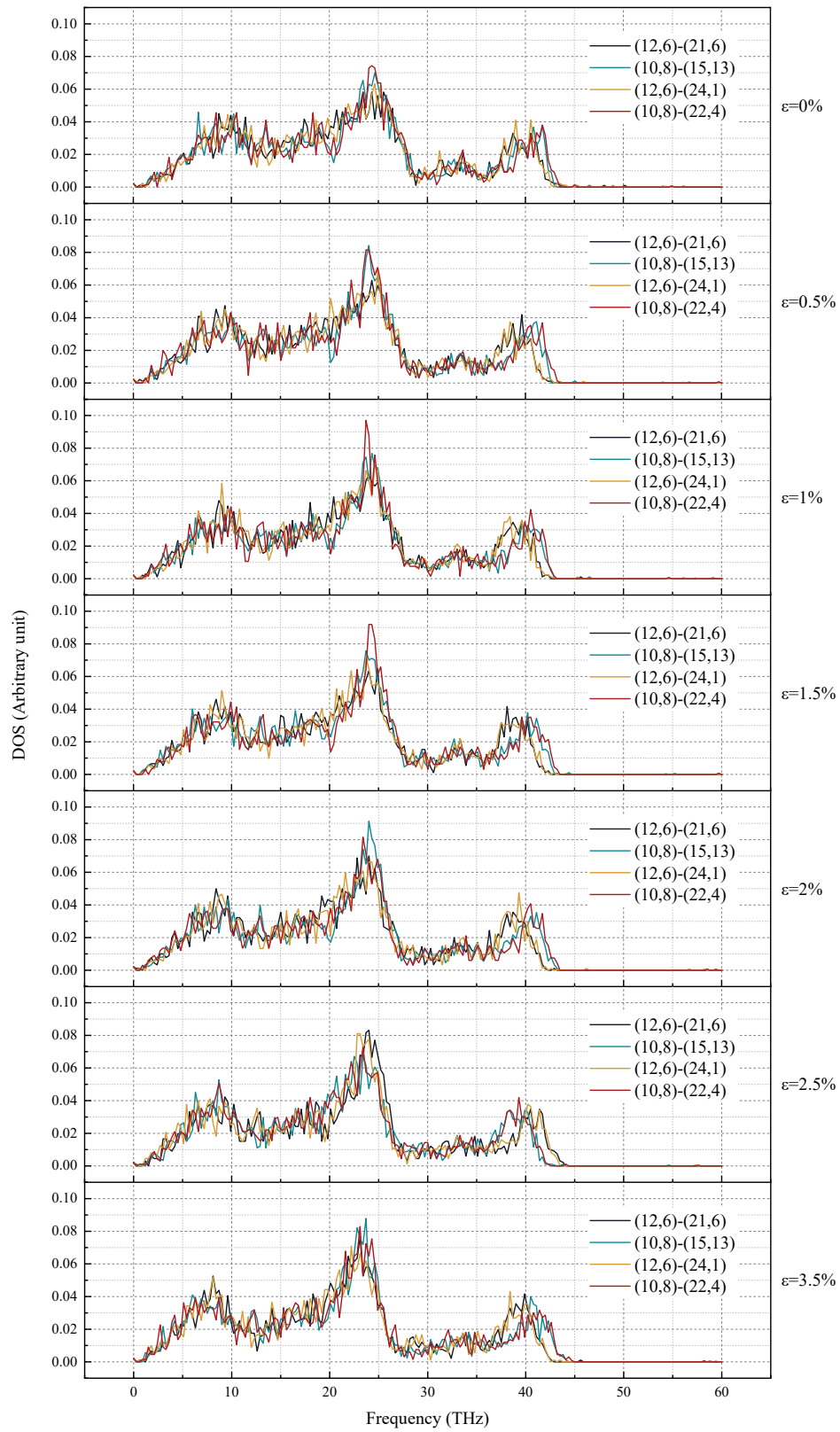


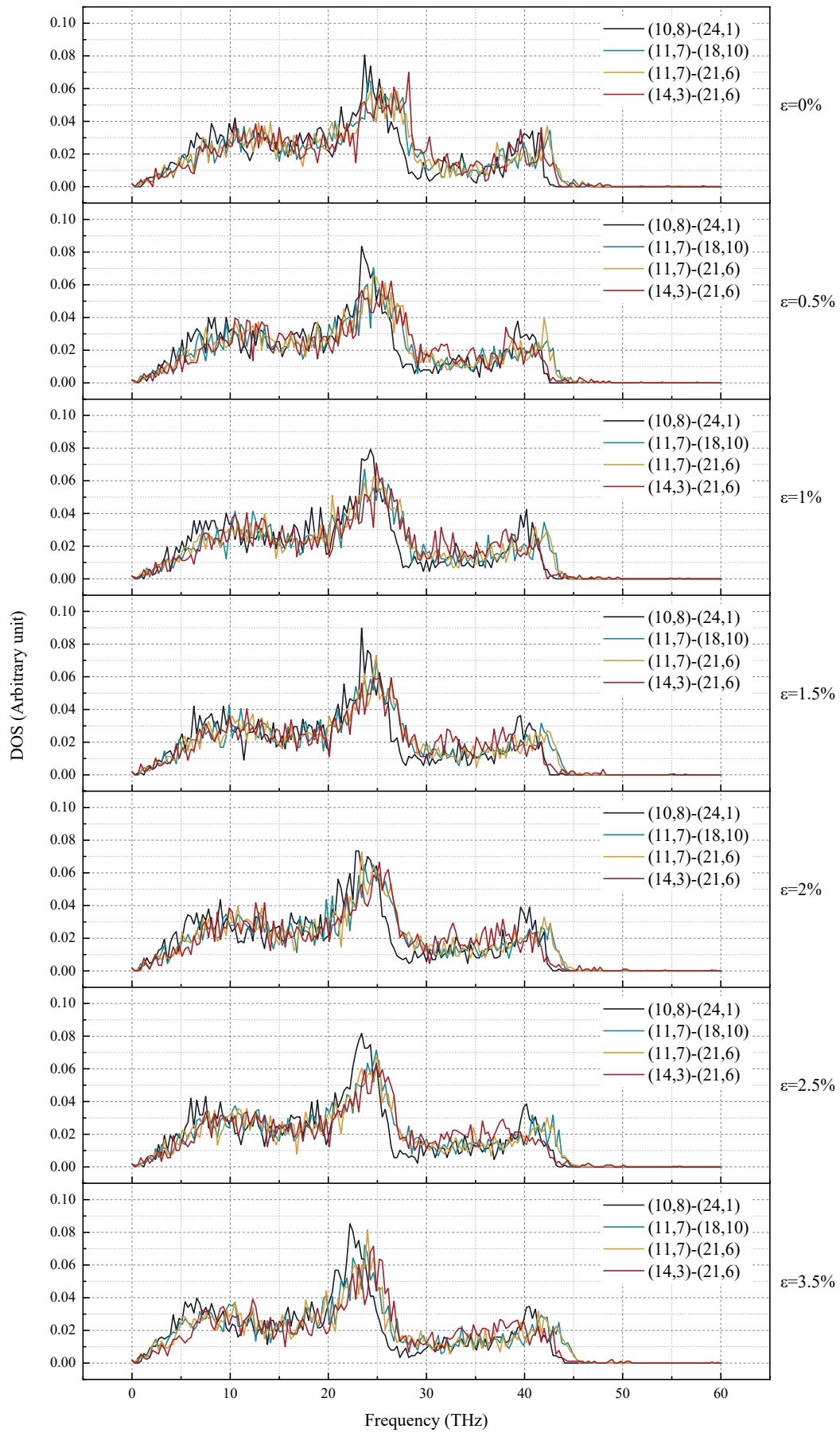
Fig. S2 The relation between the interlayer friction which correspond to DWCNTs with different chiral combinations and the $\Delta\theta$. The \bar{r} is set between (a) 5.00-5.20Å. (b) 7.45-7.55Å. (c)8.32-8.41Å. (d) 9.00-9.07Å.

2 Phonon spectra

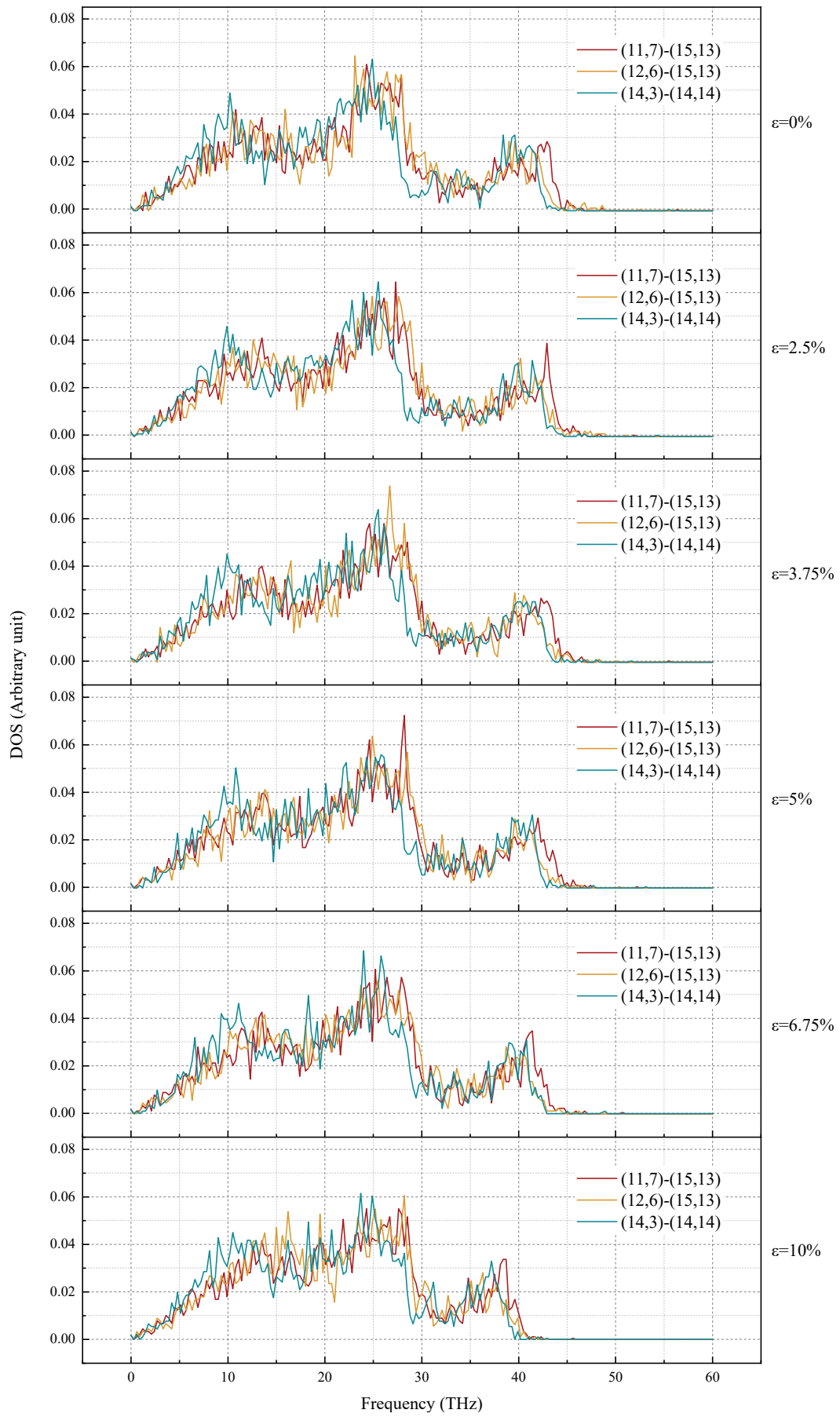
Details of phonon spectra of the DWCNTs selected to study strain effects is shown in Fig. S3



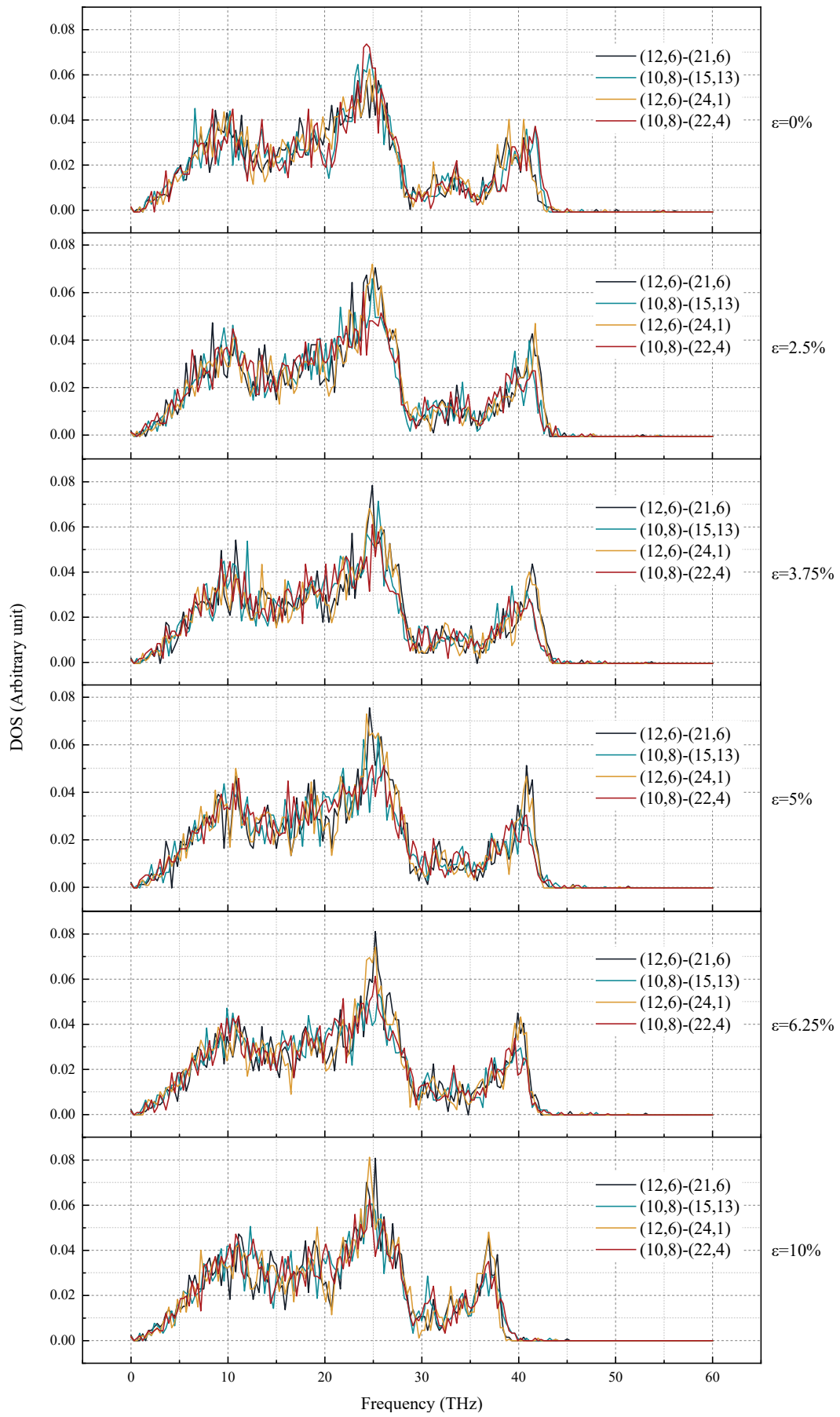
(a)



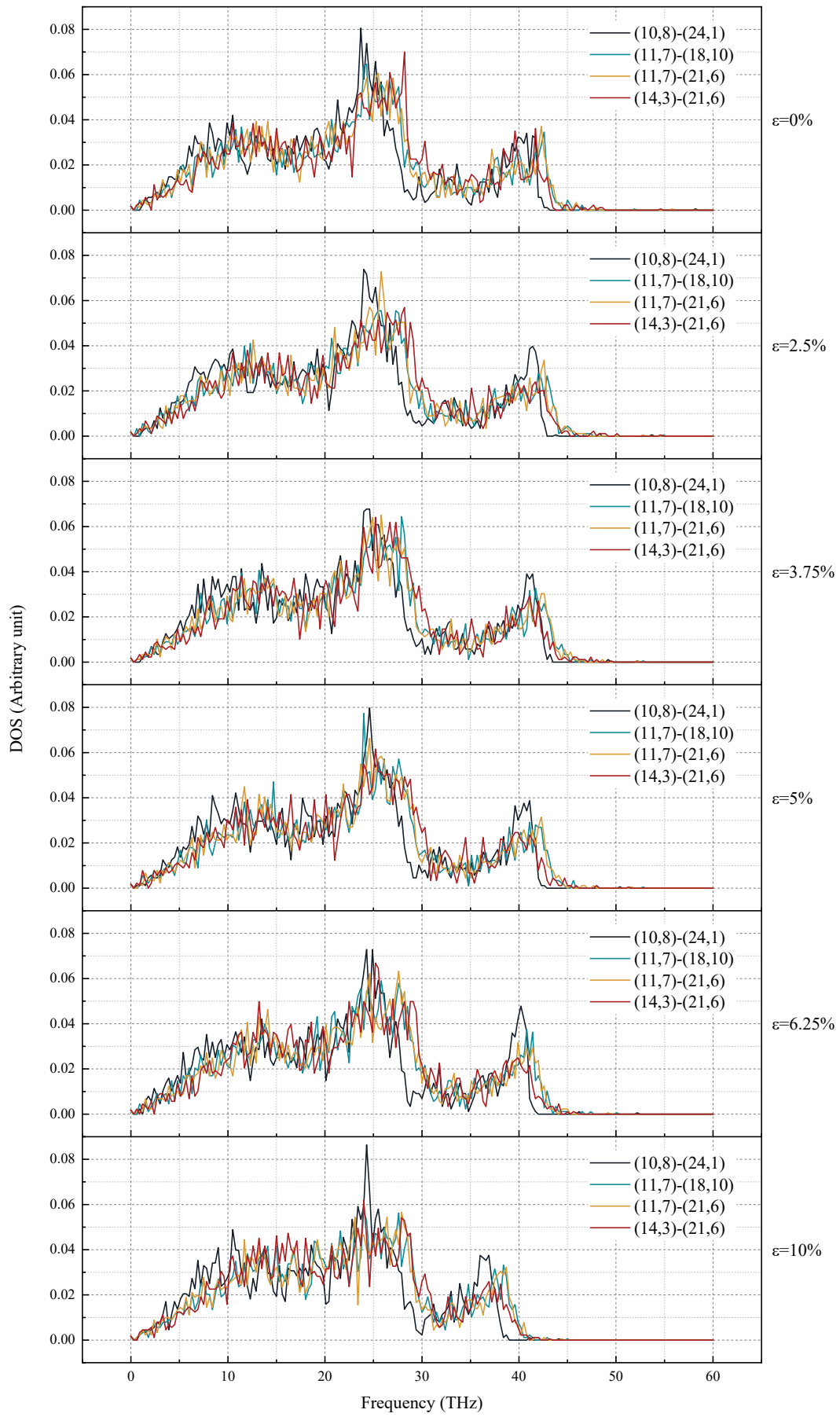
(b)



(c)



(d)



(e)

Fig. S3 The inner tube phonon spectra of different remaining chiral combination DWCNTs during high-speed pure rotational motion under varying strains. (b) to (c) represent compressive strain, and (d) to (f) represent tensile strain. (b) Inter-tube distance for DWCNTs ranging from 3.36 Å to 3.37 Å. (c) Inter-tube distance for DWCNTs ranging from 3.40 Å to 3.44 Å. (d) Inter-tube distance for DWCNTs ranging from 3.28 Å to 3.34 Å. (e) Inter-tube distance for DWCNTs ranging from 3.36 Å to 3.37 Å. (f) Inter-tube distance for DWCNTs ranging from 3.40 Å to 3.44 Å.