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标题: Molecular Dynamics Study of a Cantilevered Double-Walled Carbon Nanotube Nanomechanical Resonator
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摘要: The vibrational characteristics of a cantilevered double-walled carbon nanotube (DWCNT) resonator are studied using molecular dynamics (MD) simulations. The effects of temperature, nanotube type, ratio of tube length to diameter, and ratio of tube length between inner and outer walls on the resonant frequency of DWCNT with a long outer wall are evaluated. The simulated results show that DWCNTs have a very high frequency range from 10 to 250 GHz, which strongly depends on nanotube type and geometry characteristics. The magnitude of frequency of DWCNTs is inversely proportional to the nanotube mass. When the temperature is increased, the frequency of DWCNTs slightly decreases because the kinetic energy of carbon atoms increases. For the same aspect ratio, zigzag nanotubes have a higher resonant frequency than armchair nanotubes. The resonant frequency of DWCNTs increases with decreasing the ratio of tube length to diameter and increasing the ratio of tube length of inner to outer walls. Finally, DWCNT resonators are considered to have the largest THz frequency range at the bridge boundary condition.
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