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Nonlinear motion of cantilevered SWNT and Its Meaning to Phonon Dynamics[1] HEEYUEN KOH, JAMES CANNON, SHOHEI CHIASHI, JUNICHIRO SHIOMI, SHIGEO MARUYAMA, The University of Tokyo — Based on the finding that the lowest frequency mode of cantilevered SWNT is described by the continuum beam theory in frequency domain, we considered its effect of the symmetric structure for the coupling of orthogonal transverse modes to explain the nonlinear motion of free thermal vibration. This nonlinear motion calculated by our molecular dynamics simulation, once regarded as noise, is observed to have the periodic order with duffing and beating, which is dependent on aspect ratio and temperature. It could be dictated by the governing equation from the Green Lagrangian strain tensor. The nonlinear beam equation from strain tensor described the motion well for various models which has different aspect ratio in molecular dynamics simulation. Since this motion is nothing but the interaction between 2nd mode of radial, tangential mode and 1st longitudinal mode, it was found that Green Lagrangian strain tensor is capable to deal such coupling. The free thermal motion of suspended SWNT is also considered without temperature gradient. The Q factor measured by this theoretical analysis will be discussed.

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Heeyuen Koh
The University of Tokyo

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