

## Calculation of Lattice Thermal Conductivity for Si Fishbone Nanowire Using Modified Callaway Model

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Semiconductor nanowires have low lattice thermal conductivity compared to the bulk materials, which is significant for developing thermoelectric. Lattice thermal conductivity of Si fishbone nanowires (NWs) was found for diameters of 65, 88, and 122 nm. For this purpose, the simulations were carried out using a modified Callaway model. Both longitudinal and transverse modes were taken into account in the model, which had a significant influence on some physical parameters, such as Debye temperature and group velocity of the semiconductor. The results showed that the model could fit the experimental data because different scattering parameters exhibited their effect in the temperature range. The modified Callaway model provides phonon scattering by boundary scattering, so by reducing the NW diameter the lattice thermal conductivity is diminished for the entire temperature range. Additionally, some intrinsic characteristics of the samples, including Grüneisen parameters, impurity, dislocation, and electron concentration were found throughout the calculation process, which practically hard to be determined.

**Keywords:** Si, lattice thermal conductivity, Callaway model, phonon scattering.

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