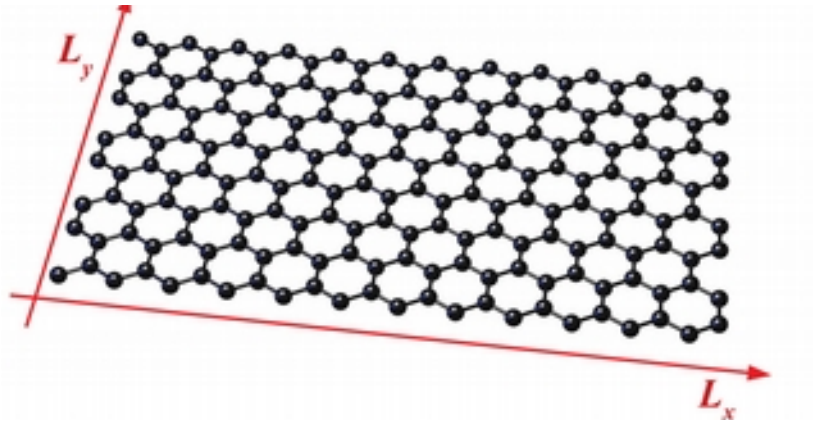
Dimensionality effect on Thermal Conductivity

Motivation



The physical quantity that expresses the ability of a material to conduct or transport heat, by diffusion or conduction, is the **intensive** material property called thermal conductivity. Despite the enormous implications in fundamental science and engineering applications, thermal transport is not fully understood, also because of the difficulties associated with the experimental and theoretical estimation of thermal conductivity [1]. Furthermore, many theoretical and experimental works [2,3,4] reported an anomalous strong dependence of the thermal conductivity on the system size in quasi 1-D objects, breaking the intensive character of the thermal conductivity.

Your Project

In this project, we will study the effect that removing systematically “rows” from a 2D graphite layer has on its thermal conductivity. The student will use Molecular Dynamics simulations with a non-equilibrium method to estimate the effect of the aspect-ratio, $L=L_x/L_y$, on the thermal conductivity.

Requirements

Background in thermal physics and thermodynamics are desirable. We would like a person interested in modeling, simulation and programming.

Other aspects

This project will be supervised by the associate Prof. Cabriolu in physics at NTNU in collaboration with Prof. Berend Smit at EPFL in Switzerland.

Contact Person

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[2] Crnjr A. et al., *Phys. Rev. Mat.* **2**, 015603 (2018)
[3] Cwang C. W. et al., *Phys. Rev. Lett.* **101**, 075903 (2008)
[4] Hsiao H.K. et al., *Nat. Nanotechnology* **8**, 534 (2013)