Temperature effect on electronic quantum transmission in novel nanostructured materials

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Overview

Nanoporous graphene (NPG) has recently attracted much attention because it represents a way to engineer quantum interference in graphene and was recently synthesized. The material is best described as a series of graphene nanoribbons where small molecular groups act as structurally binding, but electrically insulating bridges between the ribbons. By choosing the molecular group that acts as a bridge carefully, electrical contact between the bridges can be enhanced, allowing for quantum interference. These properties make NPGs appealing for nanocircuitry.

However previous calculations for NPG don’t include phonon scattering. Since phonon scattering can strongly impact currents on the atomic scale, it is possible that thermal effects are important to the cross-ribbon interactions.

Aim

The aim of this proposal is that we predict the effect of temperature and phonon scattering on the quantum interference effects in nanoporous graphene. We may introduce different molecular bridges or disorder and based on those findings propose a structure where the quantum interference effect is more resilient to temperature.

Content


Your background (DTU courses or similar)

Mandatory:
10303 Condensed Matter Physics and Nanoscale Materials Physics

Relevant:
10325 Quantum mechanical modelling of nanoelectronics
10323 Quantum transport theory
10321 Nano-2: Nanosystems engineering
10302 Electronic Structure Methods in Material Physics, Chemistry and Biology