

Electrically doped nanoscale devices using first-principle approach: a comprehensive survey

ABSTRACT

Doping is the key feature in semiconductor device fabrication. Many strategies have been discovered for controlling doping in the area of semiconductor physics during the past few decades. Electrical doping is a promising strategy that is used for effective tuning of the charge populations, electronic properties, and transmission properties. This doping process reduces the risk of high temperature, contamination of foreign particles. Significant experimental and theoretical efforts are demonstrated to study the characteristics of electrical doping during the past few decades. In this article, we first briefly review the historical roadmap of electrical doping. Secondly, we will discuss electrical doping at the molecular level. Thus, we will review some experimental works at the molecular level along with we review a variety of research works that are performed based on electrical doping. Then we figure out importance of electrical doping and its importance. Furthermore, we describe the methods of electrical doping. Finally, we conclude with a brief comparative study between electrical and conventional doping methods.

Keyword: Electrical doping; DFT; NEGF; First principle; Molecular modeling