 ISSN 2362-0412

Variation of Electric Potential in a Semiconducting Hetero Structure Placed in an External Electric Field

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Abstract

The variation of electric potential has been investigated when a semiconducting structure is placed under an external electric field. Finite Difference Methods have been employed with Mathamatica software to generate codes. An external electric field was created by applying voltages to the side faces of a box as (10V, 0V, 0V, 0V). Three-dimensional plot of electric potential versus position in x and y direction was created. By extracting data along in x or y direction a line graph of potential versus position has been created. A semiconducting strip made with two different dielectric mediums is placed inside the box so that both mediums face the 10V side at the same time. Two curves were extracted from potential map at x=7 [from medium one (ε_1)] and at x=13 [from medium two (ε_2)]. A significant change in the curve shape has been observed with the semiconducting material and without it. A faster potential drop has been observed in medium one with small dielectric constant than the medium two with larger dielectric constant. The semiconductor was rotated by 90 degrees so that only one medium faces the 10V side. A higher gradient of the potential was observed in medium one compared to medium two with large dielectric constant. Data was extracted at x=11. The potential has been changed from 10V to 5.8V when it changed to medium one. At the interface of the two mediums it has been changed to 2.36V and at the end of medium two it has been changed to 1.86V. By using these data the true electric field was calculated for different materials.

Keywords: *Dielectric, Electric Potential, Semiconductor*

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