PEMODELAN ARUS TEROBOSAN PADA TRANSISTOR EFEK MEDAN TEROBOSAN *BILAYER ARMCHAIR GRAPHENE NANORIBBON* MENGGUNAKAN METODE PENDEKATAN FUNGSI AIRY

SKRIPSI

diajukan sebagai syarat untuk memperoleh gelar Sarjana Sains
Program Studi Fisika
Konsentrasi Bidang Keahlian Fisika Material

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UNIVERSITAS PENDIDIKAN INDONESIA

2019

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ABSTRAK

Metal oxida semiconductor field effect transistor (MOSFET) berperan penting dalam rangkaian listrik dengan ukuran skala nano. Namun dengan ukurannya yang kecil, MOSFET memiliki keterbatasan untuk bekerja dalam daya ultra rendah, arus bocor, efek saluran pendek, dan peningkatan kecepatan. Keterbatasan performanya ini menjadikan *tunneling field effect transistor* (TFET) menjadi sebuah alternatif untuk menggantikan MOSFET. Pada penelitian ini, arus terobosan pada devais yang berbasis *bilayer armchair graphene nanoribbon* (BAGNR) dimodelkan dengan pendekatan fungsi Airy. Penyelesaian persamaan Schrödinger dengan pendekatan fungsi Airy menghasilkan nilai transmitansi, dari transmitansi ini dapat ditentukan nilai arus terobosan dari formula Landauer dengan bantuan metode Gauss Legendre Quadratur (GLQ). Hasil dari pemodelan menunjukkan nilai arus terobosan meningkat dengan semakin bertambahnya tegangan *gate* (V_g), tegangan *drain* (V_d) dan lebar BAGNR, sedangkan bertambahnya tebal oksida dan suhu membuat arus terobosan menurun. Karakteristik arus terobosan terhadap tegangan *gate* (V_g) dapat menentukan frekuensi *cut off* devais. Frekuensi *cut off* meningkat dengan bertambahnya tegangan *drain* (V_d), sedangkan jika N indeks dan tebal oksida bertambah maka frekuensi *cut off* menurun.

Kata kunci : Fungsi Airy, Arus terobosan, BAGNR, TFET.

MODELING OF TUNNELING CURRENT IN BILAYER ARMCHAIR GRAPHENE NANORIBBON–TUNNELING FIELD EFFECT TRANSISTOR BY USING AIRY WAVE FUNCTION APPROACH

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ABSTRACT

Metal oxide semiconductor field effect transistors (MOSFETs) has an important role in electric circuits with its nanoscale sizes. But with its small size, MOSFETs have performance limitation to work in ultra-low data, leaky currents, short channel effects, and increased speed. This performance limitation makes *the tunneling field effect transistor* (TFET) an alternative to replace the MOSFET. In this study, a drain current on devices based on *bilayer armchair graphene nanoribbon* (BAGNR) was modeled using the Airy function approach. Schrödinger equation solved with the Airy function approach produces a transmittance value, from this transmittance the drain current value can be determined from the Landauer formula with the help of the *Gauss Legendre Quadrature* (GLQ) method. The results of the modeling show that the drain current value increases with increasing gate voltage (V_g), drain voltage (V_d) and width of BAGNR while the increase in oxide thickness and temperature makes the drain current decrease. The characteristics of the drain current against gate voltage (V_g) can determine the cut-off frequency of the device. The cut-off frequency increases with increasing drain voltage (V_d) while for increasing N index and oxide thickness the cut-off frequency decreases.

Keywords: Airy wave function, tunneling current, BAGNR, TFET.

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