# PEMODELAN ARUS TEROBOSAN PADA DIODA PERSAMBUNGAN P-N *BILAYER ARMCHAIR GRAPHENE NANORIBBON* DENGAN MENGGUNAKAN METODE PENDEKATAN FUNGSI AIRY

**SKRIPSI**

Diajukan untuk penulisan sebuah skripsi untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains Program Studi Fisika


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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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## ABSTRAK

*Armchair Graphene Nanoribbon* (AGNR) merupakan salah satu dari dua tipe *Graphene Nanoribbon* (GNR) yang dapat bersifat sebagai semikonduktor atau konduktor bergantung pada jumlah atom penyusun lebarnya. Keunikan sifat listrik yang dimilikinya menarik perhatian para peneliti untuk menjadikan *graphene* sebagai material penyusun divais berbasis semikonduktor. Karena lebarnya yang sangat kecil, AGNR sangat baik digunakan sebagai material pada divais berbasis *tunneling* elektron. Pada penelitian ini, penulis memodelkan perilaku arus terobosan pada divais dioda persambungan p-n menggunakan bahan BAGNR (*Bilayer Armchair Graphene Nanoribbon*) dengan metode pendekatan fungsi Airy. Parameter yang digunakan dalam pemodelan disesuaikan dengan karakteristik dari BAGNR. Hasil pemodelan menunjukkan adanya keterkaitan antara arus terobosan dengan tegangan panjar yang diberikan, lebar BAGNR, suhu, dan medan listrik (*built in electric field*). Arus terobosan berbanding lurus dengan kenaikan tegangan panjar, lebar BAGNR, serta medan listrik (*built in electric field*), namun berbanding terbalik dengan suhu. Arus terobosan yang dihasilkan pada BAGNR jauh lebih besar dibandingkan pada MAGNR (*Monolayer Armchair Graphene Nanoribbon*). Celah pita energi pada MAGNR dipengaruhi oleh *Interlayer coupling* $\gamma_0$, sementara pada BAGNR dipengaruhi oleh *Interlayer coupling* $\gamma_0$ dan $\gamma_1$. Perbandingan hasil arus terobosan menggunakan metode fungsi Airy dengan metode WKB menunjukkan kecenderungan yang sama dan nilai yang tidak jauh berbeda.

Kata kunci: BAGNR, dioda persambungan p-n, arus terobosan, fungsi Airy

# MODELING OF TUNNELING CURRENT OF A BILAYER ARMCHAIR GRAPHENE NANORIBBON-BASED P-N JUNCTION DIODE USING AIRY WAVE FUNCTION

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## ABSTRACT

Armchair Graphene Nanoribbon (AGNR) is one of the Graphene Nanoribbon (GNR)'s type which can be role as a semiconductor or conductor depends on number of atoms that arrange its width . The unique of the electrical properties of AGNR attracted researchers to make graphene as material of semiconductor based device. Because of its tiny width, graphene is very good for application on devices with tunneling electron based. In this research, the author models the behavior of tunneling current on a BAGNR (Bilayer Armchair Graphene Nanoribbon)-based p-n junction diode using Airy function. The modeling's result show that the tunneling current has relation with bias voltage, the width of BAGNR temperature, and the built in electric field. The tunneling current is directly proportional to the forward-bias, the width of the BAGNR, and the built in electric field. It is inversely proportional to the temperature. Its value on BAGNR is bigger than on MAGNR (Monolayer Armchair Graphene Nanoribbon). Energy gap in MAGNR is affected by interlayer coupling $\gamma_0$ while energy gap in BAGNR is affected by interlayer coupling $\gamma_0$ and $\gamma_1$. The tunneling current using the Airy function method and the WKB method have the same tendency and slight different value.

Keyword: BAGNR, p-n junction diode, tunneling current, Airy function.

**DAFTAR ISI**

# DAFTAR TABEL

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