

# The Effects of Electric and Magnetic Fields on Electronic Properties of Stanene Nanoribbons

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Received: 18.09.2017    Final revised: 04.06.2019    Accepted: 26.06.2019

## Abstract

Stanene, a two-dimensional nanostructure of Sn atoms, has a honeycomb structure. The strong intrinsic spin-orbit interaction of stanene causes an energy gap of 0.07 eV in its band structure. In this research, the electronic properties of the stanene nanoribbons with zigzag edges are investigated using the tight-binding model and Green's function method and in the presence of electric and magnetic fields. In the presence of a vertical electric field, we will observe the metal-semimetal and semimetal-semiconductor phase transitions in the system. In the presence of a transverse electric field and/or magnetic field, we will have the spin band splitting. Our results show that by tuning the magnitude and direction of the electric and magnetic fields, we can control the electrical, spin, and optical properties of the system.

**Keywords:** stanene, tight-binding model, electronic properties, band structure

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