# Influence of the gate voltage and geometrical parameters on the transport characteristics of core-multishell nanowires

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The synthesis of the III-V semiconductor materials in the form of the core-shell (CS) nanowires (NW) caused an increasing interest in their electronic properties. This is partly due to the possible applications of such nanosystems in nanoelectronics, for example as quantum coherent transistors with operating characteristics controlled by electrostatic gates.

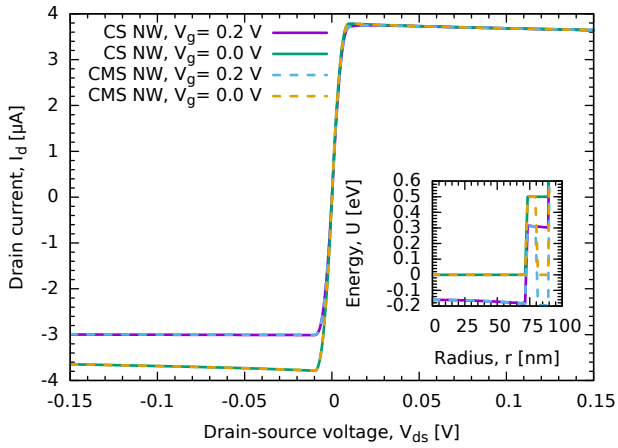


Figure 1: Current-voltage characteristics calculated for core-shell (CS) and core-multishell (CMS) nanowires in case of the applied gate voltage $V_g = 0$ and 0.2 V. The respective potential energy profiles in the middle of the gate are presented in the inset.

In this report, the influence of the gate voltage on the coherent propagation of the conduction electrons through the InGaAs/InP core-multishell (CMS) nanowires with the all-around gate is considered, when the variation of the radius of the core and the thicknesses of the shells takes place. The effect of the gate voltage on the transport characteristics of the considered nanodevice is shown in the figure. The present calculations are based on the adiabatic approximation for the 3-D Schrödinger equation with the potential distribution generated by the all-around gate which is determined by the solution of the Laplace equation. Application of the quantum transmission boundary method allows to calculate the transmission coefficient, and hence the electronic current is obtained by using the Landauer-Büttiker theory.

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