The current voltage characteristics have been obtained for the four DNA bases Adenine, Thymine, Guanine and Cytosine by non-equilibrium Green's function combined with density functional theory. The pattern of current flow for an applied voltage sweep of 0-5 V is plotted. The phenomenon of tunneling is exhibited in the characteristics of molecules. The DNA base
cytosine displays a typical surge of current in the voltage sweep section of 0.4V-0.6V, indicating single electron effects. The effect of gate voltage on the current-voltage characteristics of cytosine was studied in the gated two-probe setup. The typical section of characteristics of cytosine was re-drawn by varying the gate potential. The application of gate bias exhibits excellent ON/OFF switching for combinations of the two applied voltages- source voltage and gate voltage. Repetitive peaks are also observed in current when gate voltage is varied, fixing source potential. In this paper the cytosine molecule is proposed as a switch, AND gate and OR gate in this paper that can be used in DNA based molecular electronic devices.

Reference

- Benenson, Y. et.al. DNA molecule provides a computing machine with both data and fuel. Proc Natl Acad Sci USA 100,2191-2196.

Index Terms

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DNA bases               tunneling               single
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