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# Review and Study of Graphene Layer applications for improved GaN based high electron mobility transistors (HEMTs)

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**Abstract (not more than 300 words)**

Graphene is one of the potential participant material that has pulled in significant amount of interest by electron-device researchers because of its extraordinary electronic structure, semi-metal nature with a zero band cover (or a semiconductor with zero band-hole), direct energy dissipation and homogeneous thickness distribution of electronic states. A standout amongst the most critical properties of graphene is a solid electric field impact, which prompts an electrostatically tuneable transport density upto the extent of n $< 10^{14}$ $cm^{-2}$. In addition to the above, the carrier mobility for the electrons as well as holes that is soaring as $10^4$ $cm^2/Vs$ at room temperature, this pulls in a great deal of consideration for graphene as a conceivable material for a the upcoming high electron mobility transistors (HEMT). Be that as it may, numerous insights concerning the potential execution of graphene based HEMTs in genuine applications stay misty. Here I survey the properties of graphene that are significant to electronic semiconductor devices, talk about the pros & cons offs among these properties and analyze their consequences for the execution of graphene HEMTs in microwave range frequency applications. Gallium nitride based high electron mobility transistors (HEMTs) are exceptionally encouraging semiconducting device for high power and high temperature applications. Be that as it may, there are still many unanswered concerns, for example, current collapse and high gate leakage current, which bounds the maximum capacity execution and their full market commercialization. Truth be told, these issues lead to constrained gate voltage swing, increased static power dissipation, decreased breakdown voltage and hence, reduced ac performance. The impact of a two-dimnsional graphene layer (G) over the silicon nitride (SiN) layer of AlGaN/GaN semiconductor high electron mobility transistors (HEMTs) is methodically broken down. Results demonstrated that the devices without the graphene, max drain-current-density and maximum transconductance diminished step by step as the fog introduction time expanded. Interestingly, devices with a graphene layer, demonstrated a stablised conduct and not noteworthy variations in the electrical attributes in both dc as well as pulsed conditions. The reason and outcomes of these patterns has been talked about and it was indicated that the graphene layer as the main aspect for enhancing the dampness obstruction of the SiN layer.

Keywords—Graphene, HEMT, GaN, MODFET

**Professional Biography (100-150 words)**

Pankaj Pathak received B.Sc. Physics and M.Sc. Physics specialization in electronics, all from Rohilkhand University, India in 1992 and 1994 respectively. He received his Ph.D. degree in electronic Science from University of Delhi in 2000. He also completed a postgraduate level course (M. Tech. - Computer Science) from Institution of Electronics & Telecommunication Engineers, Delhi. He is currently Professor and Research Head (R&D) with G.L. Bajaj Institute of Technology & Management, India and Adjunct Professor in school of engineering and technology, Sharda University to guide Ph.D. scholars. He is board member, mentor and technical adviser of various innovative start-ups and companies. He joined department of electronic science, University of Delhi as Research Scholar/Lecturer from 1996 to 2000. He has 17 years of electronics & IT research and product development experience with leading private sector organizations. He has 8 product patents, 15 copyrights and 40+ research papers in various notional as well as International journals. He is life corporate member of Institution of Electronics & Telecommunication Engineers and member of Semiconductor Society of India. His research interests include semiconductor/microwave communication semiconductor devices, bio-medical sensors, embedded & VLSI system design.



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**Any Comments:**