



Fundamentals of III-V Semiconductor MOSFETs

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Fundamentals of III-V Semiconductor MOSFETs presents the fundamentals and current status of research of compound semiconductor metal-oxide-semiconductor field-effect transistors (MOSFETs) that are envisioned as a future replacement of silicon in digital circuits. The material covered begins with a review of specific properties of III-V semiconductors and available technologies making them attractive to MOSFET technology, such as band-engineered heterostructures, effect of strain, nanoscale control during epitaxial growth. Due to the lack of thermodynamically stable native oxides on III-V's (such as SiO₂ on Si), high-k oxides are the natural choice of dielectrics for III-V MOSFETs. The key challenge of the III-V MOSFET technology is a high-quality, thermodynamically stable gate dielectric that passivates the interface states, similar to SiO₂ on Si. Several chapters give a detailed description of materials science and electronic behavior of various dielectrics and related interfaces, as well as physics of fabricated devices and MOSFET fabrication technologies. Topics also include recent progress and understanding of various materials systems; specific issues for electrical measurement of gate stacks and FETs with low and wide bandgap channels and high interface trap density; possible paths of integration of different semiconductor materials on Si platform.



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