WHY DO WE NEED SHOTTKY DIODES BASED ON SILICON CARBIDE?

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Electronic market is nowadays one of the fastest-growing branches of industry. No less than 30% of generated electricity is currently converted from AC to DC by a semiconductor power devices. With great probability, this number should rise up to 80% by the end of year 2030. In this light, looking for a new energy and cost efficient devices seems to be not only challenging, but also desired.

An interesting candidate for building high power and high frequency devices is silicon carbide [1]. However, quality of the samples is crucial for potential applications of this compound [2, 3]. Although, epitaxial SiC is widely used, there is still room for improvement, especially when it comes to reducing defects in epi-layers structures. Therefore, we would like to present the results of our work on unintentionally-doped and low-doped n-type (N_2) epi-layers.

The epitaxial growth is conducted at temperatures exceeding 1550-1600˚C and rates of 5-10 μm/h on up to 4-in 4H-SiC(0001) wafers in an R&D Aixtron VP508 and production type reactor Aixtron G5 WW.

The samples are tested by various method. Nitrogen concentration is monitored with SIMS (Secondary Ion Mass Spectroscopy) and low-temperature Raman spectroscopy. Charge carrier concentration is investigated with room-temperature Raman spectroscopy. SEM (Scanning Electron Microscopy), AFM (Atomic Force Microscopy), defect etching and photo-assisted DLTS (Deep Level Transient Spectroscopy) gives information about surface and crystal quality.

The last step planned is to build Shottky diodes for 1,9 and 3,3kV using homoepitaxial SiC layers.

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