ON THE PREPARATION OF SEMIINSULATING SIC BULK CRYSTALS BY THE PVT TECHNIQUE

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High resistivity, s.i. SiC single crystals are gaining more and more importance as substrate for high frequency electronic devices based on both SiC and GaN. Vanadium can act in SiC as a deep level for the electrical compensation of residual impurities leading to specific resistivities up to 10^{15} Ωcm. In this paper recent results on vapor growth (PVT) and characterization of nominally undoped and p-codoped SiC:V crystals are presented. Prerequisites for the preparation of s.i. SiC are achievement of high purity process conditions, uniform co-doping with an acceptor (boron) and homogeneous V-incorporation during growth without exceeding the solubility limit ($\approx 1 \cdot 10^{17}$ cm^{-3}). Our efforts on process purification have lead to material with a low impurity level showing carrier concentrations $n \leq 1 \cdot 10^{16}$ cm^{-3}. SiC:B crystals with carrier concentrations $1 \cdot 10^{13}$ $cm^{-3} \leq p \leq 5 \cdot 10^{15}$ cm^{-3} have been prepared. B segregation was studied. Analysis on V incorporation in SiC was performed. Electrical compensation of V was determined by ESR and optical absorption. Specific resistivity ρ and its radial uniformity have been measured showing semi-insulating behavior. The origin of ρ-inhomogeneities is discussed in terms of process conditions and V related defect formation.