Electrical Characteristics of p-Si/MgO/ n-Zn_{1-x}Mg_{x}O Heterojunction

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In the paper the current – voltage – temperature (I-V-T) measurements and space charge techniques, capacitance – voltage – temperature (C-V-T) and deep level transient spectroscopy (DLTS) have been applied to investigate defects in p-Si/MgO/ n-Zn_{0.9}Mg_{0.1} heterojunction (HJ). The HJ structure was grown on p-type Si (111) substrate of resistivity equal to 0.1Ωcm by plasma-assisted molecular beam epitaxy technique. The growth temperature was 450°C. The I-V-T measurements confirm rectifying properties of the HJ with the rectification coefficient ranging from $10^2$ at 350K up to $10^4$ at 270K at a voltage bias of ±2V. The dark current transport was explained using Anderson’s model of a HJ. The saturation current is thermally activated with the activation energy equal to 0.42eV. DLTS studies reveal the hole trap of close activation energy (0.42 eV) confirming the result obtained from the I-V measurements. It was found that the defects related to this trap have a point like behaviour. DLTS measurements performed at different reverse bias let us conclude that the trap may be assigned to the n-Zn_{0.9}Mg_{0.1}O layer. Moreover, from the comparison of the trap properties with the literature data it can be anticipated that it is aluminum related trap [1].


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