Characterisation of p-Si/SiGe/Si inverted remote doped structures using X-ray and electrical techniques

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Abstract: In this work, the epitaxially grown, lattice–matched p-Si/Si$_1-x$Ge$_x$/Si inverted remote doped structures have been characterized using X-ray and electrical techniques. The Si cup layer thickness ($l_c$) and Ge content ($x$) have been determined from computer simulation of intensity and angular separation of (004) peaks observed in the X-ray diffraction pattern due to misorientation of corresponding Bragg planes of Si and SiGe layers. On the other hand, a quasi two dimensional hole gas (2DHG) is formed in the compressively strained alloy of these structures and its areal density ($n_s$) has been measured by Hall experiment and can be controlled by applying a voltage ($V_g$) to the artificial gate. In the electrical technique, $x$ and $l_c$ characteristics have been obtained using theoretical calculations of the linear dependence of $n_s$ versus $V_g$. Finally, the uncertainty and partial inconsistent of the results have been explained in terms of the affecting effects.

Keywords: Si/SiGe structure, Si/SiGe characterisation, X-ray and Hall technique.