Application of scanning transmission electron microscopy (STEM)-based techniques for development of novel Si/SiGe on SOI FinFET structures

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ABSTRACT

This work illustrates the application of scanning transmission electron microscopy (STEM)-based techniques to enhance the process control of Si/SiGe FinFETs on SOI. A high angle annular dark field (HAADF) STEM together with nanobeam diffraction (NBD) was used to monitor the SiGe thickness and strain inside the fin and between the Si/SiGe layers. The results show that the Si/SiGe underwent asymmetric relaxation with greater strain along the length of the fin and less strain perpendicular to the fin, which agrees with previous publications (1-2). In addition, the strain gradient on both sides of the Si/SiGe interface can be measured; the degree of gradient is a measure of the compliance in each material. These results illustrate the application of STEM-related techniques to monitor complex FinFET structures. Similar applications can be used for novel 3D structures like III-V FinFETs and nanowires.

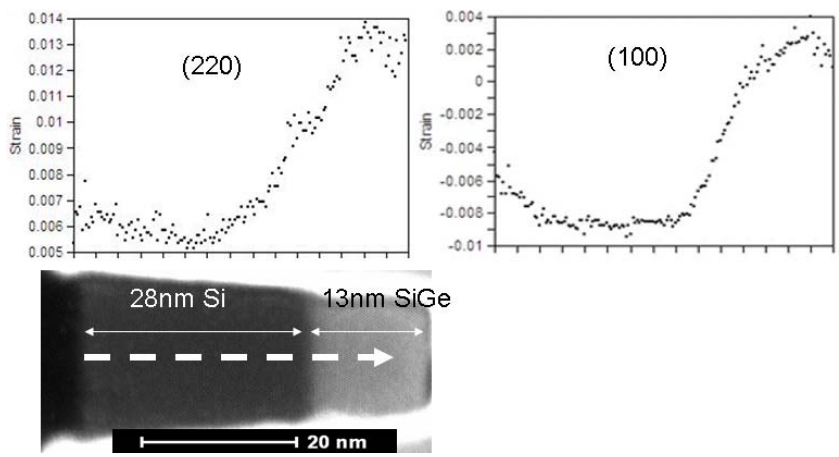

FIGURE 2. NBD strain profiles in the (220) and (100) Si plane taken from fin with target structure of 30 nm Si/10 nm SiGe. Strain profile was taken along the dotted white line in reference from the HAADF TEM (bottom)

REFERENCES

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