

# Quantitative Strain Measurement Using Nanobeam Electron Diffraction and Dark Field Electron Holography

A. Béch <sup>1</sup>, C. Bougerol<sup>2</sup>, B. Daudin<sup>2</sup>, J.L. Rouvi re<sup>2</sup>, D. Cooper<sup>3</sup>

<sup>1</sup> FEI Company, Achtseweg Noord 5, 5651GG Eindhoven, The Netherlands

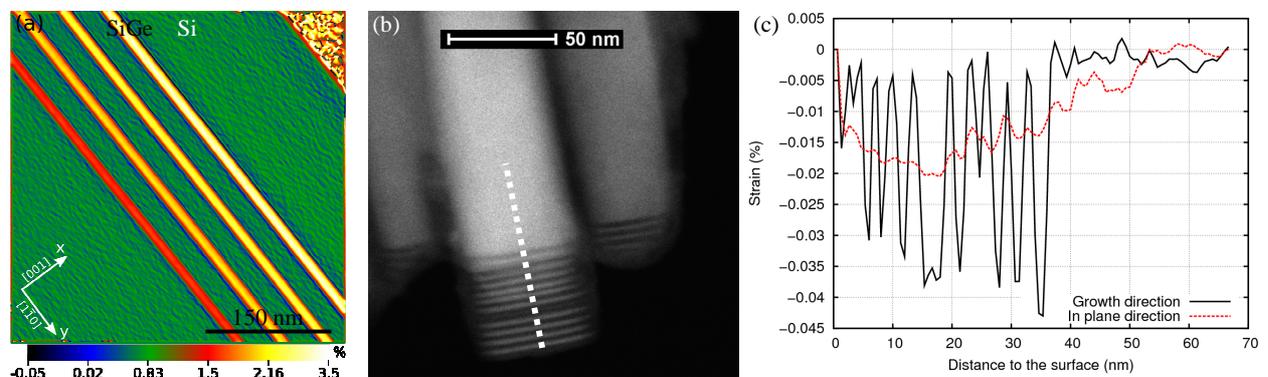
<sup>2</sup> CEA-Grenoble, INAC/SP2M, 38054 Grenoble, France

<sup>3</sup> CEA-Grenoble, Leti-Minatech, 38054 Grenoble, France

## ABSTRACT

Nanobeam Electron Diffraction (NBED or NBD) [1] and Dark Field Electron Holography (DFEH) [2,3] are recently developed transmission electron microscopy (TEM) based techniques that are able to quantitatively measure the strain with a spatial resolution of a few nanometers and a strain sensitivity of respectively  $6.10^{-3}$  [4] and  $2.10^{-4}$  [5].

We will compare both techniques applied to different samples like SiGe multilayers on Si (Fig. 1.a), nanowires (Fig 1.b and 1.c) and SOI devices. We will discuss the advantages and disadvantages of each technique when applied to these different samples. Criteria like sample preparation, spatial resolution, processing time, required TEM competences and reliability of strain measurement will be used to classify NBED and DFEH. Finally, it will appear that these two techniques are complementary and should both be applied on the same sample Severy time it is possible.



**FIGURE 1.** (a) Strain map obtained by DFEH on SiGe multi-layers embedded in a Si matrix. (b) GaN nanowire presenting AlN insertion barriers. (c) NBED strain profile of the GaN/AlN nanowire presented in (b).

## REFERENCES

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