Growth of one-dimensional Si/SiGe heterostructures by thermal CVD

Celine Mouchet *et al* 2008 *Nanotechnology* **19** 335603 (4pp)
Celine Mouchet[1], Laurence Latu-Romain[1], Cyril Cayron[2], Emmanuelle Rouviere[1], Caroline Celle[1] and Jean-Pierre Simonato[1]
[1] CEA, LITEN, DTNM, LCH, 38054 Grenoble, France
[2] CEA, LITEN, DTH, Grenoble Electron Microscopy @ Minatec, 38054 Grenoble, France
E-mail: jean-pierre.simonato@cea.fr

Abstract. The first results on a simple new process for the direct fabrication of one-dimensional superlattices using common CVD chambers are presented. The experiments were carried out in a 200 mm industrial Centura reactor (Applied Materials).

Low dimensionality and superlattices allow a significant increase in the figure of merit of thermoelectrics by controlling the transport of phonons and electrons. The monocrystalline nanowires produced according to this process are both one-dimensional and present heterostructures, with very thin layers (40 nm) of Si and SiGe. Concentrations up to 30 at.% Ge were obtained in the SiGe parts.

Complementary techniques including transmission electronic microscopy (TEM), selected area electron diffraction (SAED), energy dispersive x-ray spectroscopy (EDS), scanning transmission electron microscopy (STEM) in bright field and high angle annular dark field (HAADF STEM), and energy-filtered transmission electron microscopy (EF-TEM) were used to characterize the nanoheterostructures.