Growth of gold-free hexagonal Ge on GaAs nanowires by molecular beam epitaxy

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Abstract

Obtaining light emission from group IV materials is a topic of high interest because of their abundance and their compatibility with the silicon photonics [1-2]. However, they have indirect-bandgap due to their natural cubic form that prevents them to realize efficient light emission. It has been shown that Ge and Si materials in hexagonal phase have different characteristics in comparison to their cubic phase [3-4]. Recently hexagonal SiGe shells were grown on wurtzite GaAs NW template using MOCVD and gold catalyst [5]. In this contribution we demonstrate the possibility to use gold-free GaAs nanowires on silicon substrate for subsequent growth of hexagonal germanium.

GaAs nanowires were grown in a molecular-beam epitaxy (MBE) reactor via selfassisted growth following the VLS method using Ga as a catalyst. An extended pure wurtzite segment was maintained by tuning the V/III ratio to appropriate value [6]. Following the growth of the GaAs core, Ge shell has been grown with different thicknesses. The growth has been continuously monitored by *in situ* reflection high energy electron diffraction (RHEED). Highresolution scanning transmission electron microscopy (STEM) and dark field transmission electron microscope (TEM) confirmed the long extended hexagonal phase of Ge. The Ge surface chemistry was studied by X-ray photoelectron spectroscopy (XPS).

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