

SELF-CATALYSED GROWTH OF SILICON NANOWIRES USING LOW TEMPERATURE CHEMICAL VAPOR DEPOSITION

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Abstract

Majority of deposition techniques for preparation of silicon nanowires (Si NWs) anticipate using of metal seed for the growth initialisation via vapor-liquid-solid (VLS) approach. However, those metals - especially most used Au - act as deep level traps for free charge carriers resulting in deteriorated properties of micro- and optoelectronic SiNW components. The solution bases on avoiding metal seeds and applying self-catalysed approach. Although very few works have been published dealing with this approach, the possible benefit has an important impact on SiNW technology. Therefore we deposited SiNWs onto molybdenum substrates using low pressure chemical vapor deposition (LPCVD). During the experiment the temperature was fixed at 500 °C a the pressure approximately at 45 Pa. As a result, SiNws were grown with length up to several microns and width from about 40 to 200 nm depending on experimental conditions. Several analytical techniques were used for characterisation of SiNW deposits: scanning electron microscopy (SEM), high resolution transmission electron microscopy (HRTEM), energy dispersive X-ray analysis (EDX), Raman spectroscopy and selected area electron diffraction (SAED).

Keywords: Silicon, nanowire, CVD, self-catalysed

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