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Controlling the Geometrical Orientation of Hot-wire Chemical Vapor Process Grown Silicon Nanowires

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Abstract

In this work, the effect of chamber pressure on the morphology of hot wire chemical vapor processed silicon nanowires (SiNWs) using Sn as catalyst has been studied. It is observed that their geometrical orientation can be controlled as per requirement by adjusting the growth pressure. SiNWs synthesized at low pressure of 0.67 Pa grow preferentially perpendicular to the substrate. If the pressure is increased to 1.3 Pa, SiNWs become tilted to the substrate and have bending type structure with random distribution. Further increase in the chamber pressure to 4 Pa very few wires are seen to grow and at 5.3 Pa no-growth of SiNWs is observed. Transmission electron microscopy study shows that the straight SiNWs have crystalline structure whereas the bent ones show polycrystalline structure.

Keywords: silicon nanowires, Sn catalyst, VLS mechanism, hot-wire CVP, geometrical orientation.

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