A Comparison of Power Factor in $N$ and $P$-Type SiGe Nanowires for Thermoelectric Applications

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This work presents the thermoelectric properties of $n$- and $p$-type doped SiGe nanowires and shows the potential to generate electricity from heat difference over nanowires. The $Si_{0.74}Ge_{0.26}$ layers were grown by reduced pressure chemical vapor deposition technique on silicon on insulator and were condensed to the final $Si_{0.53}Ge_{0.47}$ layer with thickness of 52 nm. The nanowires were formed by using sidewall transfer lithography (STL) technique at a targeted width of 60 nm. A high volume of NWs is produced per wafer in a time efficient manner and with high quality using this technique. The results demonstrate high Seebeck coefficient in both $n$- and $p$-types SiGe nanowires. $N$-type SiGe nanowires show significantly higher Seebeck coefficient and power factor compared to $p$-type SiGe nanowires near room temperature. These results are promising and the devised STL technique may pave the way to apply a Si compatible process for manufacturing SiGe-based TE modules for industrial applications.

**Keywords:** Thermoelectric, SiGe Nanowires, Power Factor, Sidewall Transfer Lithography, condensation.