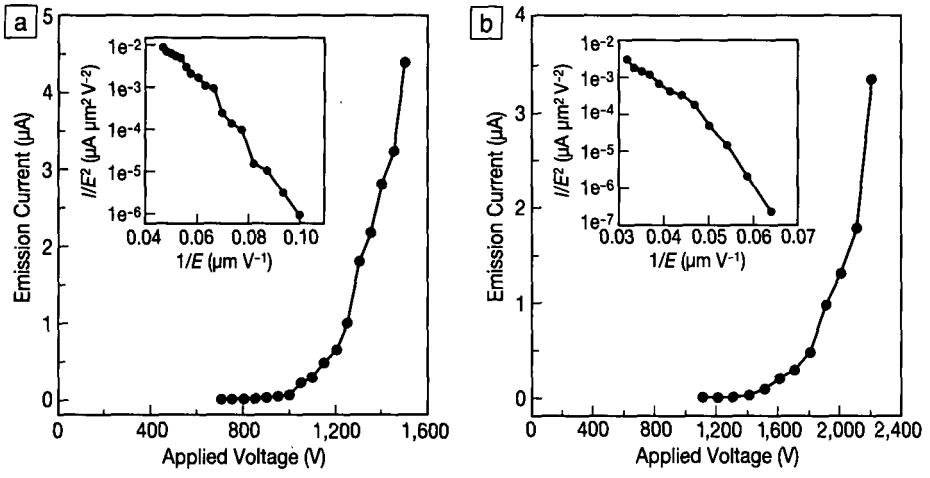

Figure 8. Current versus voltage (I-V) results from (a) Si and (b) SiC nanowires. The insets are Fowler-Nordheim plots of ln(I/E²) against (1/E).

Summary

A new method based on oxide-assisted growth has been developed that is capable of producing a bulk quantity of various semiconductor nanowires including Si and Ge. The presence of oxides in the target is a common and essential ingredient for the synthesis when using laser ablation or thermal evaporation techniques, in order that the targets are capable of generating semiconductor oxides in the vapor phase. Subsequent decomposition of the vapor-phase oxides at high temperatures plays a crucial role in the nucleation and growth of high-quality nanowires. In the case of Si, nanowires can be synthesized from metal-, SiO_2-, Ge-, or Fe_2O_3-containing Si targets or from SiO powders. Irrespective of the oxide type contained in the target, the resulting nanowires show no significant difference in their morphology and microstructure. Thick Si oxide shells are also present on the Si nanowires grown from the metal- and Fe_2O_3-containing targets. These semiconductor nanowires show unusual optical and field-emission characteristics that may be exploited for potential applications. Thus the ability to synthesize large quantities of such nanowires from this powerful technique offers exciting possibilities for fundamental and applied research.

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