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Selective burning of metallic single-walled carbon nanotubes for integration of transistors KEIGO OTSUKA, TAIKI INOUE, SHOHEI CHIASHI, Univ of Tokyo, SHIGEO MARUYAMA, Univ of Tokyo, National Institute of Advanced Industrial Science and Technology — High-density arrays of semiconducting single-walled carbon nanotubes (s-SWNTs) are promising building blocks for next-generation digital systems. Since direct growth of SWNTs on single-crystal substrates offers excellent alignment and cleanliness, much effort has been made to avoid short circuits derived from metallic SWNTs (m-SWNTs) by selective etching from as-grown aligned SWNTs. Although electrical breakdown is a powerful tool because of high selectivity of the removal and compatibility with high-density SWNTs, it would remarkably degrades on-current in ultrascaled devices because extremely high field is required to cut SWNTs. We propose a method for full-length burning of m-SWNTs triggered by Joule self-heating toward pure s-SWNT arrays and integration of transistors. The burning of SWNTs was enhanced by polymer coating and additional water vapor. The burning length was increased from 100 nm to 5.5 um (half of the SWNT length) on average. We found the burning length was restricted by one-way burning from breakdown position, where oxidation occurred first. By controlling the breakdown position, nearly full-length burning was achieved for all m-SWNTs. Multiple transistors were fabricated along the obtained s-SWNT arrays, showing excellent performance.

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