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Type control of Single Walled Carbon Nanotube field effect transistors and Its application UN JEONG KIM, Samsung Advanced Institute of Technology, SHIN CHEOL MIN, Hanyang University, HYUNG BIN SON, SEONGMIN YEE, Samsung Advanced Institute of Technology, WOOJONG YU, Sungkyungwan University, GYU TAE KIM, Korea University, YOUNG HEE LEE, Sungkyungwan University, EUNHONG LEE, Samsung Advanced Institute of Technology, WANJUN PARK, Hanyang University, JONG MIN KIM, Samsung Advanced Institute of Technology, FRONTIER RESEARCH LAB TEAM, SEMICONDUCTOR MATERIAL & DEVICE COLLABORATION, NANO DEVICE LABORATORY COLLABORATION, CARBON NANOTUBE RESEARCH LABORATORY COLLABORATION — Permanently type controlled single walled carbon nanotube (SWNT) field effect transistors, from p-type, ambi-polar to n-type, have been fabricated by controlling deposition temperature of Al_2O_3 film as top-gate dielectric by atomic layer deposition (ALD). It is observed that threshold voltage (V_{th}) is almost linearly downshifted as a function of deposition temperature. Competition between electron transfer from the of Al_2O_3 layers to the SWNT surface and electron capture by oxygen molecules adsorbed on the tube wall seems to be the key point for the V_{th} change depending on the deposition temperature. To prove the high performance of type controlled SWNT network transistors, inverter, NAND, and NOR gate characteristics are successfully demonstrated.

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