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Analysis on the Characteristics of Single-walled Carbon Nanotube Transistor Printed by Roll-to-Roll and Roll-to-Device Method

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Flexible electronics, a future technology of electronics, require a low cost integrated circuit that can be built on various types of the flexible substrates. As a potential candidate for this application, a single walled carbon nanotube network is studied as an active device with a scheme of thin film transistor. Transistors are formed on a plastic foil by the Roll-to-Roll (R2R) and the Roll-to-Device (R2D) printing method. For both printing methods, electrical transports for the transistors are presented with the temperature dependence of threshold voltage (V_{Th}) and mobility from the measured transfer curves at temperatures ranging from 10 K to 300 K.

It is observed that $\mu=0.044\text{cm}^2/\text{V} \cdot \text{sec}$ and $V_{Th}=7.28\text{V}$ for R2R and $\mu=0.025\text{cm}^2/\text{V} \cdot \text{sec}$ and $V_{Th}=3.10\text{V}$ for R2D, both for the temperature at 300K. Temperature dependence of mobility and V_{Th} is observed. However for R2R, the temperature dependence of V_{Th} is constant. It is the difference between, R2R and R2D.

Keywords: carbon nanotube, temperature characteristics

