Title: Semiconducting carbon nanotube fibers for electrochemical biosensor platforms

Authors: Jin Yong Lee[1], Tae Young Jeong[1], Dong-guk Cho[2], Sae Jin Sung[1], Woong-Ryeol Yu[1]*

[1]Department of Materials Science and Engineering, Seoul National University, South Korea

[2]Physics and Astronomy, Seoul National University, South Korea

Abstract:

Diabetes is a global public health issue. This metabolic disorder is derived from insulin deficiency and is reflected by blood glucose levels outside the normal range. It is essential to monitor glucose levels to maintain normal blood glucose levels by administering insulin until the treatment method of diabetes is discovered. The glucose concentration is conventionally monitored by collecting blood and using a reaction of glucose in the blood with enzymes in the biosensor. However, the blood sampling method has many difficulties such as fainting, hematoma, vascular damage, and blood collection failure. Thus, sweat-based glucose monitoring devices have attracted much attention from researchers. Because sweat glucose sensors should be sensitive enough to detect small amounts of glucose in sweat, it is important to choose the right platform for glucose to react with glucose oxidase enzymes. In this study, a high-sensitivity glucose detector capable of detecting even a small amount of glucose was developed. Carbon nanotube (CNT)-based transistor for biosensing glucose was fabricated using CNT fibers spun from semiconductor single-wall carbon nanotubes (sc-SWNTs). The sc-SWNT fibers were prepared using a sufficient amount of sc-SWNTs separated from metallic single-walled CNT. Enzyme coated fiber transistors were then fabricated using sc-SWNT fibers, showing the conductance changes even at 10 uM glucose concentration. Therefore, it is expected that the monitoring of glucose concentration through sweat can be possible just by wearing clothes made of the fiber transistors.