Direct patterning of V$_2$O$_5$ nanowires on SiO$_2$ substrate by using $\mu$-contact printing technique

Yong-Kwan Kim, Sung-Jun Park, Jeong Sook Ha, Dong Jin Oh*, Gyu Tae Kim*

Department of Chemical & Biological Engineering, Korea University
*Department of Electrical Engineering, Korea University

Extensive attention has been paid to the field of nano-fabrications due to their high potential in future nano-device technology. Synthesis of right nano-materials and their alignment at specific positions are the two major concerns, which should be solved for the real application. In this experiment, we have transferred V$_2$O$_5$ nanowires to a desired position on a SiO$_2$ substrate by a $\mu$-contact printing (MCP) technique. In MCP procedure on the aminopropyltriethoxysilane (APS)-treated SiO$_2$ substrate, we showed that the hydrophilicity of PDMS stamp affects the transfer mechanism of nanowires. The V$_2$O$_5$ nanowires were transferred through a relief side of the hydrophilic stamp whereas they were transferred along the recess edge of the hydrophobic one forming a percolated network. The width of the transferred pattern could be controlled by a concentration of nanowire solution and drying time. These results suggest that the edge transfer mechanism in MCP process be related to chemical interaction between the stamp and the ink. In addition, the electrical conductivity of the percolated network of V$_2$O$_5$ nanowires was measured.