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Patterned Surface Functionalization of Dot-Arrayed CNTs for Biochip Sensor Using Scannable Ultrafine Atmospheric Pressure Plasma Jet MITSURU OKADA, Shizuoka University, Japan, TOMY ABUZAIRI, Shizuoka University, Japan and Universitas Indonesia, Indonesia, SUDEEP BHATTACHARJEE, Indian Institute of Technology Kanpur, India, NJI R. POESPAWATI, RENTO W. PURNAMANINGSIH, Universitas Indonesia, Indonesia, MASAAKI NAGATSU, Shizuoka University, Japan — The present results show that the feasibility of using a dot-arrayed CNT as a biochip sensor was demonstrated by successfully fabricating CNTs in an array form and performing patterned surface functionalization of amino and carboxyl groups onto CNT. The vertically aligned CNT was fabricated in an array form using a combined thermal-plasma CVD for realizing the development of biochip sensors. Patterned surface functionalization was developed by ultrafine APPJ in two stages: (1) pretreatment by He gas with -500V dc bias and (2) posttreatment without bias by a He/NH3 gas mixture for amino group or by a He/O2 gas mixture for carboxyl group functionalization. The analysis results of chemical derivatization indicate that amino and carboxyl groups successfully functionalized the CNT dot array without interfering with each other. The optimum period of ultrafine APPJ treatments was achieved by balancing the following 3 aspects: (1) effective area of modification, (2) amount of surface functionalization, and (3) damage of the CNT. Finally, the patterned surface functionalization of amino and carboxyl groups was successfully conducted in the arbitrary pattern by using ultrafine APPJ automatically scanned by computer-controlled precision stage.

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