Formation of latticed nanostructures by Surface-Patterning Technique for the Application to Nano-Device

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The nanowires using the conjugation of DNA and metal (e.g., Ag, Au, Cu and Pd) are essential building blocks to realize the nanometer-scaled electronic devices and are being extensively investigated to apply to nano-scale electronic devices. However, there are remaining some problems for realization of DNA device such as fixing on specific location and aligning with uniform interval. We report a new method to carefully control the interval of gold nanowires (AuNWs) using surface-patterning techniques. In this technique, a process to form latticed nanostructures involves three steps: (1) nano-road was generated on oxide surface, chemically treated with 3-aminopropyltriethoxysilane (APS) which has a NH3+ terminal group, patterned by electron beam lithography (2) Îż-DNA molecules were stretched and aligned on chemical nano-road by tilting techniques. (3) AuNWs were formed by the electrostatic interaction between DNA and gold nanoparticles. By the combination of a tilting technique and surface-patterning technique, we could selectively align Îż-DNA molecules and AuNWs by chemical nano-roads of 500 nm interval on Si substrate. We used atomic force microscopy (AFM) and field emission scanning electron microscope (FE-SEM) to analyze the configuration of AuNWs.

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