Formation Rate of DNA Nanowires According to the APTES Concentration.

Taek-Woon Kim, Nam-Hoon Kim and Yonghan Roh*
School of Information and Communication Engineering,
Sungkyunkwan University, Suwon 440-746, Republic of Korea
*Corresponding Author: yhroh@skku.edu

Abstract : Nanowires are promising options for building nanoscale electronic structures coming from high conductivity of nanowires. In particular, Deoxyribonucleic acid (DNA), which is structurally nanowire, can obtain highly ordered electronic components for nanocircuitry and/or nanodevices because of its very flexible length controllability, nanometer-size diameter, about 2 nm, and self-assembling properties. In this work, we used the method to form DNA-Nanowires (NWs) by using chemical treatment on Silicon (Si) surface, and Aminopropyl-triethoxysilane (APTES) was used as inducer of DNA sequence to modify the characteristics of Si surface. Moreover, we performed tilting technique to align DNA by the direction of flow of DNA solution. We investigated the assembly process between DNA molecules and APTES - coated Si surface according to the APTES concentration, from 1.2$\mu\ell$ to 120 $\mu\ell$. Atomic Force Microscopy (AFM) images showed the combination rate of DNA molecules by the change of APTES concentration. As APTES concentration becomes thicker, aggregation of DNA molecules occurs, and this makes a kind of DNA networks. In this respect, we confirmed that there's a positive relationship between the concentration of APTES and the formation rate of DNA nanowires. Since there have been lots of research preceded to utilize DNA nanowires as template, so by using this positive relationship with proper alignment technique, realization of nano electronic devices with DNA nanowires might be feasible.