A DNA-aligned Cast Film and its Electron Conductivity

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DNA has been known as a biopolymer controlling heredity, which has phosphoric anions in backbones, stacked base pairs, and double helical structures. These structural properties are very attractive for utilizing DNA as functional biomaterials. Recently, we reported a DNA-lipid complex, in which cationic lipids bind electrostatically to DNA's phosphoric anions. Although a natural DNA is a water-soluble polymer, the DNA-lipid complex is soluble in organic solvents and cast as a transparent physically stable film. When the film is stretched in one direction, DNA strands aligned uniformly along the stretching direction. The aligned-DNA film was fixed on a comb-type electrode and showed an ohmic electric current (10^{-3} S cm^{-1}) along DNA strands in the film, but a very small current across the strands (10^{-6} S cm^{-1}). Since the length of DNA strands (30,000 bp) is *ca*. 10 μm and can across two electrodes (5 μm distance), we could observe the current through one DNA molecule. It is concluded from AC and DC measurements and those temperature dependencies that it is the electron conduction but not ion conduction through a DNA strand.

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