

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

Development of Novel Replaceable Polymeric Matrices for DNA Separation by Capillary
Electrophoresis: Synthesis & Characterizations

By

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Human genome project (HGP) was started in 1990 and accomplished 2003, with the completion of human DNA sequence in April 2003. However, the researchers are still sponsored to improve the throughput and to reduce the cost of DNA analysis. As a major technology to achieve human genome project, DNA sequencing is expected to achieve a four to five orders of magnitude decrease in the cost of sequencing a human genome, resulting in a cost of \$1,000 or less for sequencing about \$10 million bases. That, if could be achieved in next 5- 10 years, will induce a revolution on biological research and medical application.

DNA sequencing is to determine the exact order of the bases (A, T, G, and C) which requires separating or identifying DNA chemical subunits in one base resolution. A sieving matrix is required to perform the separation, because the mobility of DNA molecules is independent of molecular size in free solution as they have the same charge density. The effectiveness of the separation medium plays a central role in separation performance since it determines the DNA fragment migration behavior as well as the resolution. Currently, polymer solutions are dominant in the market due to their easy replacement and automation.

A good separation medium should have the qualities of high sieving ability, dynamic coating ability and low viscosity, which can be achieved by mixing of different homopolymers or copolymers and copolymerization of different monomer segments. A ultra-high-molecular-weight linear polyacrylamide (LPA) was synthesized by frozen method and its mixture with poly(dimethyl acrylamide) was tested as the sequencing matrix, resulting in a read length of 1000 base. Polypropylene chains were grafted onto LPA to induce the "viscosity swichable" properties for easy handle. Finally, nanostructures formed by pluronic gels were characterized and 2-D hexagonal packed cylinders was first proved to be a good DNA separation medium.

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