Research Tools

Rapid, Capillary-Based Synthesis of DNA and Other Large Chain Molecules

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WARF: P04139US

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a rapid, efficient and cost-effective method for the synthesis of large chain molecules like DNA.

Overview

DNA synthesis is evolving from chip-based synthesis to a method where oligomers are synthesized and subsequently harvested so this genetic material can be used in a construction kit-type system. This alternative approach may reduce costs and increase efficiency.

The Invention

A UW–Madison researcher has developed a rapid, efficient and cost-effective method for the synthesis of large chain molecules such as DNA. The method involves synthesizing oligomers within a quartz capillary or column filled with quartz microspheres ranging in diameter from a few microns to hundreds of microns rather than on the surface of glass slides using an optical system formed by a DLP chip and a UV lamp. The synthesis taking place within the quartz column is patterned after DNA synthesis in the MicroArray Synthesizer (MAS) component of the Automated Gene Synthesizer (AGS).

A series of LEDs are located along the quartz capillary to illuminate different portions of the column. The microspheres or other carrier particles within the column are coated with a photoprotecting group that makes a linker between the surface of the sphere and the oligomers. Upon exposure to light from an LED, the photoprotecting group is removed. When a base flows through the column, it will attach to the regions that have been deprotected by light from specific, activated LEDs. Then the LEDs are turned off and reagents that reprotect the regions are applied. This process of selective illumination, deprotection and attachment of a new base is repeated until the desired sequences have been formed on the carrier particles at each section. The synthesized molecules then may be removed for use or further processing.

Applications

- DNA synthesis

Key Benefits

- Replaces a complicated optical system, including the previously required UV light source, DLP and optics, with a simple array of LEDs and some micro-optics
- Close-packed microspheres provide a much larger surface area than a flat slide.
- Individually addressable LEDs allow each microcolumn to produce as many different sequences as there are LEDs.
- Oligonucleotides can be released as fragments or sections that can subsequently be assembled to form the desired DNA sequences.
- Many different oligomers can be synthesized in parallel in relatively large amounts without the need for complex optics or optical modulators, reducing the cost of production.

Tech Fields

- Research Tools : DNA & RNA tools

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854