Multiple Passes of an Individual Single-Stranded Nucleic Acid through a Nanopore

Tech ID: 32800 / UC Case 2015-236-0

BACKGROUND

A nanopore sensor can be used to sequence nucleic acid polymers by suspending a protein channel in a membrane and applying a voltage across the membrane. When a nucleic acid polymer passes through the nanopore, it partially blocks the ionic current through the nanopore in a characteristic way unique to the sequence of the polymer. At the time of this disclosure, nanopore sequencing techniques could only provide a single read of the nucleic acid polymer. Multiple reads of the polymer could improve accuracy of nanopore sequencing.

TECHNOLOGY DESCRIPTION

The process is illustrated below. A 3' adapter and a 5' adapter are ligated to a sequence of interest. The 3' adapter includes a 2-D nucleic acid structure such as a G-quadruplex structure. It also includes a site for binding a processive enzyme such as a helicase. Charge differential across the nanopore causes a single stranded nucleic acid polymer to be captured by and enter the nanopore for sequencing.

The 2-D structure and the processive enzyme at the 3' end prevent the nucleic acid polymer from fully transiting through the nanopore. Then action by the processive enzyme pulls the nucleic acid back through the nanopore where it can be sequenced in the opposite direction. When the processive enzyme reaches the 5' adapter, abasic sites incorporated into the 5' adapter result in the dissociation of the processive enzyme from the strand of interest.

The process can continue through an indefinite number of iterations.

CONTACT

Jeff M. Jackson
jjackso6@ucsc.edu
tel: .

INVENTORS

- Rand, Arthur

OTHER INFORMATION

KEYWORDS

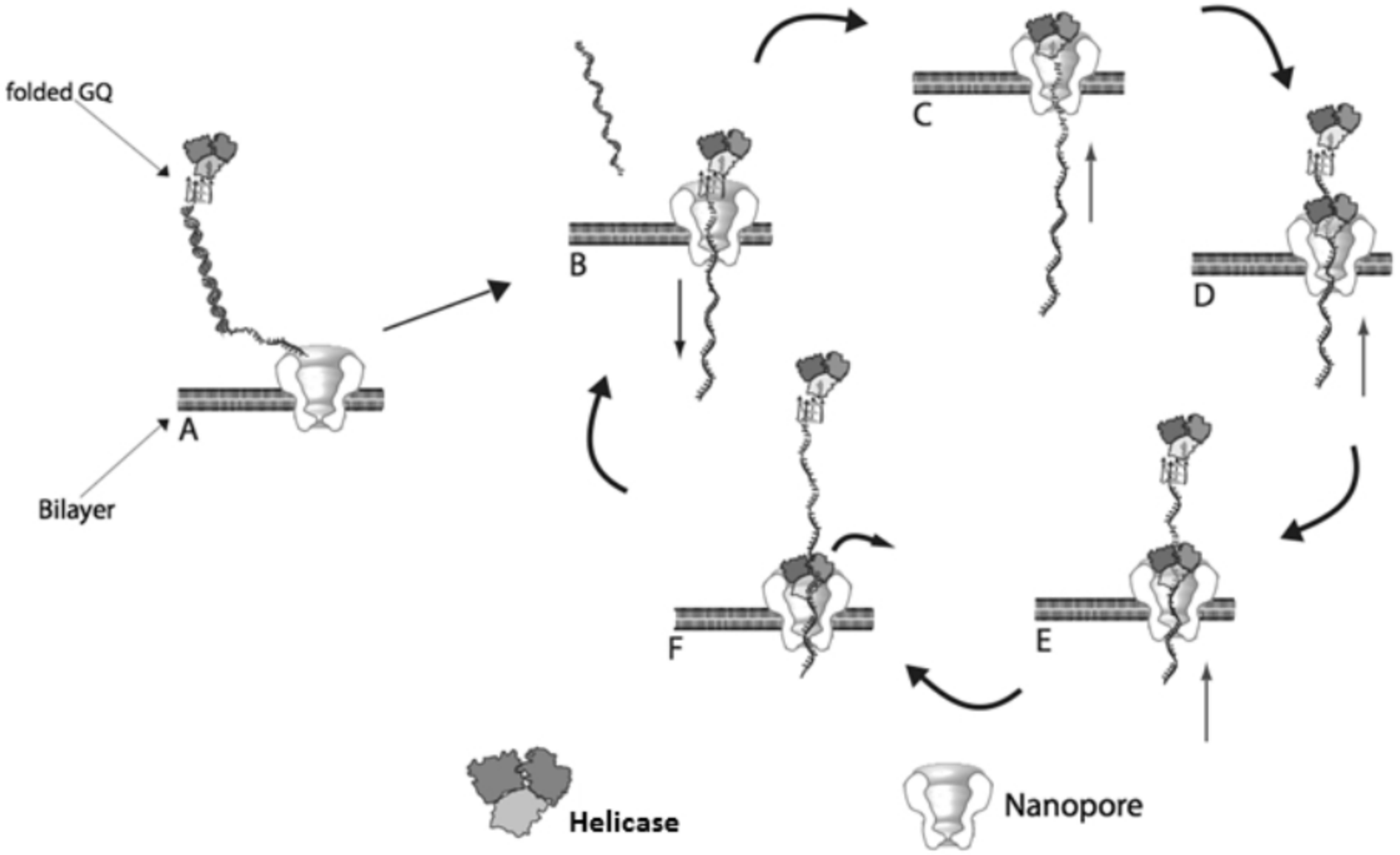
Nanopore sequencing, Processive enzyme, Helicase, Long read sequencing, Multiple pass nanopore sequencing, Nanopore flossing

CATEGORIZED AS

- **Research Tools**
  - Nucleic Acids/DNA/RNA

RELATED CASES

2015-236-0



APPLICATIONS

- Long read sequencing
- Nanopore sequencing

ADVANTAGES

Multiple passes on the same molecule can increase accuracy of nanopore sequencing

Direct DNA or RNA sequencing

Issued claims to nucleotide constructs, methods, and kits.

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,104,947	08/31/2021	2015-236
United States Of America	Issued Patent	10,421,998	09/24/2019	2015-236

Additional Patent Pending

University of California, Santa Cruz
Industry Alliances & Technology Commercialization
Kerr 413 / IATC,
Santa Cruz,CA 95064

Tel: 831.459.5415
innovation@ucsc.edu
https://officeofresearch.ucsc.edu/
Fax: 831.459.1658