Columbia Technology Ventures

Single Molecule Sensor on Nanopore platform for Ion Channel Studies

Technology #cu12278

Ionic channel measurements probe the flux of current across a membrane. These current fluxes can be used as signature markers for specific molecules and as such are a potentially powerful tool for drug discovery, medical diagnostics and DNA sequencing, but have been previously limited by low sensitivity and low throughput of conventional nanopore sensors. This technology integrates a complementary metal oxide (CMOS) amplifier design and nanopore membrane in various configurations for multiplexed ionic channel measurements. By doing so, yields an improved class of nanopore sensors useful for biophysical studies and practical biomedical applications.

High Throughput Single Molecule Sensing with Improved Sensitivity and Design Flexibility for Broad Suitability for in vitro and in situ Applications

High resolution sensing of single molecules has been hitherto limited by background noise in the nanopore, with a maximal measurable bandwidth of 100kHz. By reducing the parasitic capacitance of the system, this technology improves that bandwidth to at least 1 MHz thus improving the sensitivity. This technology utilizes low noise amplifiers, which have significantly lower parasitic capacitances than traditional external amplifier platforms. Additionally, parasitic capacitance arising from unfavorable interactions with the ionic electrolytes is reduced by protectively coating the nanopore membrane and amplifier surface. Lastly, the electrode is integrated closer to the amplifier, at a distance of 100 microns compared to the typical 10 centimeters to reduce parasitic capacitance.

The planar amplifier design of this CMOS nanopore platform also lends itself to the possibility of parallel detection schemes. This technology is equipped with multiple pre-amplifiers in parallel for multiplexed ionic channels measurement. This multiple detection scheme in conduction with higher resolution sensing can yield high throughput measurements that could be useful for commercial applications. This CMOS Nanopore platform is able to incorporate various design configurations for increased flexibility. A range of interface designs are specified in this technology to accommodate a wide range of in vitro and in situ applications.

Lead Inventor:

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Applications:

- High throughput nanopore sensors
- High throughput DNA sequencing
- Drug discovery and screening efficiency
- Biocompatible implantable sensors
- Chemical and environmental sensors
- Ion channel measurements and kinetic studies

Advantages:

- High bandwidth sensing
- High throughput detection through multiplexing
- Flexible design configurations for broad range of applications

Patent information:

Patent Pending

Licensing Status:

Available for licensing and sponsored research support

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Related Publications:


Further Information:
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