Scilight

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Portable solid-state nanopore device is used for sensing molecules in Antarctic samples

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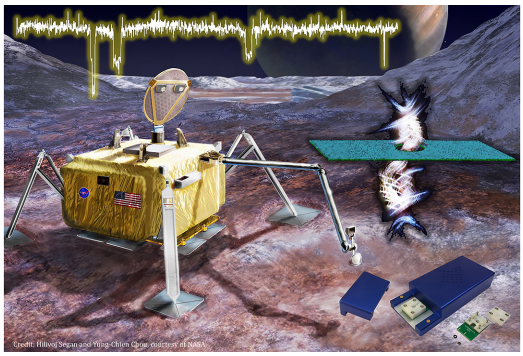
A solid-state nanopore device, perfect for sensing biomolecules, holds potential for use on space missions and in extreme environments.



Devices used to detect biomolecules on other planets and moons need to be robust enough to withstand extreme environments and harsh factors such as radiation and chemical exposure. Scientists have turned to earthly analog environments to research the development of these devices such as those for extraterrestrial expeditions.

Niedzwiecki et al. developed a device using nanopores to detect and analyze nanoscale particulates and biomolecules, such as DNA in artificial seawater and dirt particles from Antarctica. The small, portable solid-state nanopore sensing reader gathers data at bandwidths up to 100 kHz.

The researchers chose to use silicon nitride solid-state nanopores due to their resilience to pressure, radiation levels and other stressors, as well as their ability to detect single molecules one by one.

They demonstrated through experiments the device's ability to detect multiple types of biomolecules, including DNA, BSA and microRNA. The 20 nm thick, reusable nanopores were able to sense and differentiate DNA fragments with precision and sensitivity, as well as the size and charge of nanoscale particulates. These experiments were performed using both “pure” laboratory samples, with only one analyte, and more realistic “dirty” samples from Antarctica, which contained several different analytes.

“We want to develop a solid-state nanopore sensor which can operate successfully in space and we need to prove that it is robust enough to survive in even the harshest environments,” said author Marija Drndic. “We want to continue to improve this platform in a holistic sense, not just the nanopores themselves but also the kits, extraction methods and sample preparation.”

Source: “Detection of single-analyte and environmental samples with silicon nitride nanopores: Antarctic dirt particulates and DNA in artificial seawater,” by David Niedzwiecki, Yung-Chien Chou, Zehui Xia, Federico Thei, and Marija Drndic, *Review of Scientific Instruments* (2020). The article can be accessed at https://doi.org/10.1063/1.5138210.