Interesting Press Release from GSI on

New sensor for SARS-CoV-2 and other viruses based on GSI nanotechnology

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New sensor for SARS-CoV-2 and other viruses based on GSI nanotechnology

Better and faster virus detection with single nanopore membranes

An international interdisciplinary team of researchers developed a test method that detects SARS-CoV-2 in saliva,
- without sample pretreatment,
- with the same sensitivity as a qPCR test, and
- in only 2 hours.

The sensor can distinguish infectious from non-infectious corona viruses: a crucial innovation.

The fact that this method can distinguish infectious from noninfectious viruses is an essential innovation.

The well-known PCR tests detect viral genetic material

but cannot distinguish whether a sample is infectious

or whether a person is contagious.

The only tests which can currently detect infectious viruses are plaque assays. They require special preparation and days of incubation before providing results..

The new aptamer-nanopore sensor yields results within 30 minutes up to two hours and requires no pre-treatment of the sample.

The highly sensitive nanopore sensor
specifically detects SARS-CoV-2 viruses and human adenovirus
in a variety of specimen
including saliva, serum or environmental samples such as wastewater.

The sensor combines two key components: a sensitive nanochannel and highly specific DNA molecules attached to the channel surface.

The method is as precise as PCR tests, but simpler and faster

The results are published in the prestigious journal Science Advances.

The technology for the fabrication of membranes with single nanopores has been developed at GSI over many years.

Thin polymer films are irradiated with one individual high-energy heavy ion projectile (e.g. 1 GeV gold ion) at the linear accelerator UNILAC.

As the ion passes through the film, it creates a nanoscopic damage trail that is converted into an open nanochannel by chemical etching. The precise diameter and the shape of the channel are adjusted by the etching parameters. For this work, asymmetric nanopores with a small opening of less than 50 nanometers were fabricated. The small size and the specific geometry ensures a particularly high level of sensitivity for transport processes through the channel

The selectivity of the sensor is provided by an in-vitro selection process for DNA fragments, so-called aptamers, which are incorporated into the nanopore.

The applied aptamers were developed by Ana Sol Peinetti during her work as a postdoctoral researcher at the University of Illinois at Urbana-Champaign.
Being familiar with the GSI nanopore technology from her previous stay in the group of Omar Azzaroni, at the Institute for Theoretical and Applied Physicochemical Research (INIFTA, CONICET-UNLP) (Argentina), she successfully combined both technologies.

An interdisciplinary team of scientist of the
- Materials Research Department of GSI
- National Scientific and Technical Research Council (CONICET) in Argentina
- University of Illinois in the USA

Ongoing collaboration on new projects testing various virus inactivation protocols.

Great potential beyond the Corona pandemic

Vision:

to integrate the functionalized nanopore membrane

into a portable device

for rapid and efficient virus detection and diagnosis

This press release with pictures is available on our website at:

https://www.gsi.de/en/start/news/details/2021/10/07/neuer-sensor-fuer-sars-cov-2-und-andere-viren-auf-basis-von-gsi-nanotechnologie