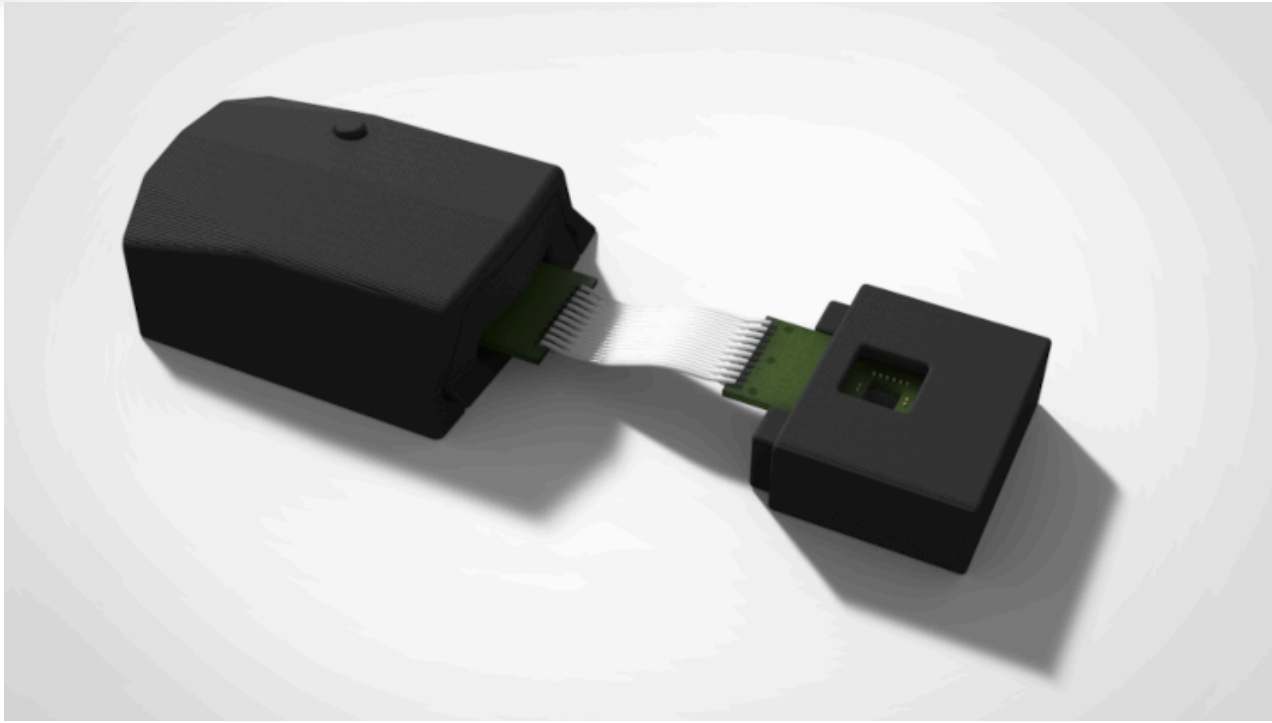


VIRUSENSING, A NEW RAPID SARS-COV-2 REUSABLE BIOSENSOR



The SARS-CoV-2 virus is a positive-stranded RNA Betacoronavirus able to infect the human respiratory epithelial cells thanks to the interaction with the human angiotensin-converting enzyme 2 (ACE2).

Starting from this consideration, we designed a sensing system able to quickly and specifically detect the complete and infective coronavirus particle, made of a biosensor able to specifically detect the entire SARS-CoV-2 by using an engineered version of the human ACE2 receptor, well-oriented on a graphene surface.



PRIORITY NUMBER

102021000000533



KEYWORDS:

Biosensor, covid-19, FET graphene sensor, S1 spike protein, SARS-CoV-2.



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DESCRIPTION

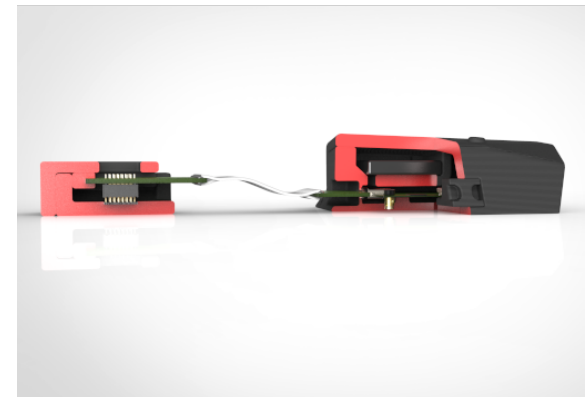
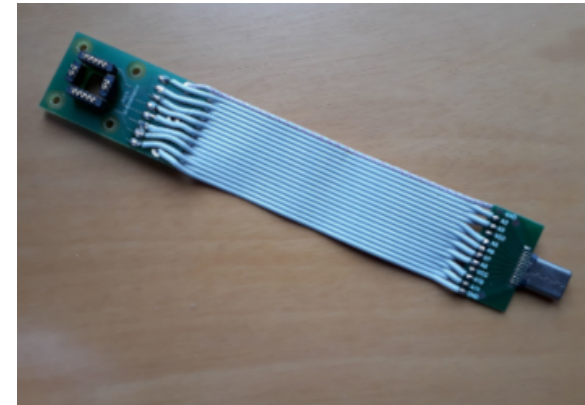
SARS-CoV-2 virus can infect the human respiratory epithelial cells thanks to the interaction with ACE2 enzyme, through a glycosylated spike (S) protein. The spike is a trimeric transmembrane protein whose monomers are composed of two subunits (S1 and S2) each. In the available solved structures, only one monomer was trapped with the receptor-binding domain (RBD) in the activated configuration (up), necessary to bind ACE2 and mediate host cell invasion. ACE2 receptor is composed by a C-terminal collectrin-like domain that ends with a single transmembrane helix and an N-terminal peptidase domain that is responsible for the interaction with the RBD.

The biosensor we developed is composed of a graphene-based FET with well oriented engineered ACE2 receptors on its surface. Graphene-based FETs are widely used and validated in the field of biosensors. The conductive graphene channel, placed between the electrodes, can give variation on the charge mobility when a biomolecule perturbs its initial state. This variation leads to an electrical conductivity change allowing to transduce biological information into an electrical signal. Prototype is currently at TRL 4 level, close to level 5 (testing on real Covid patients is on the way). It is expected, in the absence of specific funding for invention development, to reach level 7 by the second half of 2022.

APPLICATIONS

- Medical analysis;
- Mass population screenings;
- Research activities;
- Diagnostics;
- Installation in air ducts to monitoring closed environments.

ADVANTAGES



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- The ability to orient the bioreceptors (probes) on the graphene sheet significantly improves the sensitivity of the device;
- It works with any bioreceptor type (proteins, antibodies, nanobodies);
- Using specific receptors allows to increase the sensor selectivity, allowing the development of a single virus specific sensor;
- ViruSensing chips are reusable, thanks to a simple washing procedure.