

## Development of Biosensors for functional textile applications

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### Abstract

SARS-CoV-2, the cause of the disease COVID-19, has a high level of contagiousness, and has been verified as a major epidemiological threat.

In order to reduce the spread of the virus, the entire population was advised to use personal protective equipment, among which are the face masks. The efficacy of masks depend on the time of use, amount of moisture and contact with infectious agents.

The objective of this study is the development of a colorimetric biosensor, based on biological reactions that detect a given analyte through color change. This biosensor will be incorporated in a textile surface, with the capacity of direct indication of the protection effectiveness of the face masks, giving the user information about the filtration level of the equipment, with a humidity sensor; and of the contamination space, with a sensor to detect the presence of the virus.

Thus, a biosensor for SARS-CoV-2 is intended to indicate the contact with the virus. It was developed based on gold nanoparticles functionalized with sialic acid, to be coupled with a humidity biosensor and previously presented to scientific community.

The humidity biosensor is intended to contribute to reduce the risk spread and contagion of the disease, by monitoring the effectiveness of the protection of the masks, since humidity causes the degradation of the filtering quality of the masks.

For the development of the humidity biosensor, two approaches were adapted: clay and silica mesoporous, which will be impregnated, together with the SARS-CoV-2 biosensor, on a textile surface, and then incorporated into the textile mask.

The developed biosensor appears to be more reliable through silica-based technology with methylene blue dye, is aligned with the Portuguese standard for textile face masks that indicate up to 4 hours of use and  $[85\pm 5]\%$  of maximum relative humidity, as maximum levels expected for the inutilization of the masks. After reaching this humidity the biosensor changes color, indicating to us the need for mask replacement.