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Detection of SARS-CoV-2 by plasmonic optical fibers and molecularly imprinted polymers

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Detection of SARS-CoV-2 by plasmonic optical fibers and molecularly imprinted polymers

Outline

- Plasmonic sensor based on a D-shaped Plastic Optical Fiber (POF)
- Molecularly Imprinted Polymer (MIP) for SARS-CoV-2 detection
- Experimental setup
- Experimental results
- Conclusions

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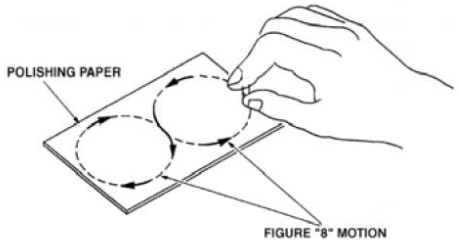
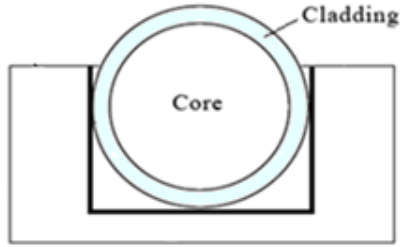
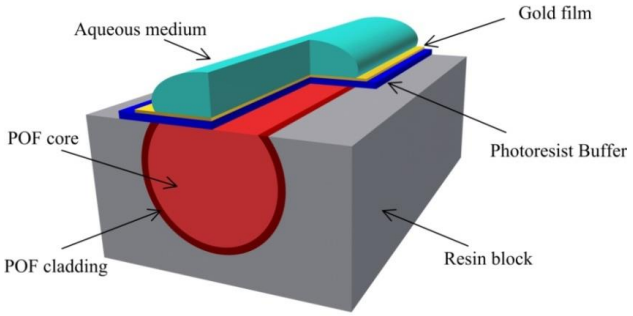
Plasmonic sensor based on a D-shaped Plastic Optical Fiber (POF)

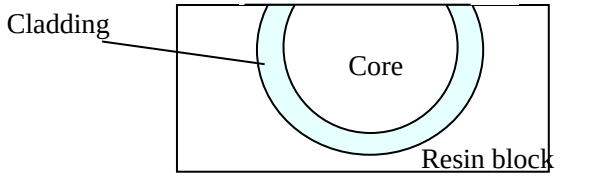


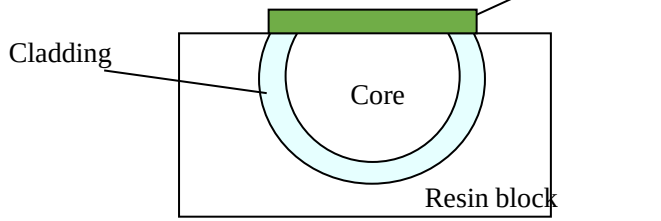


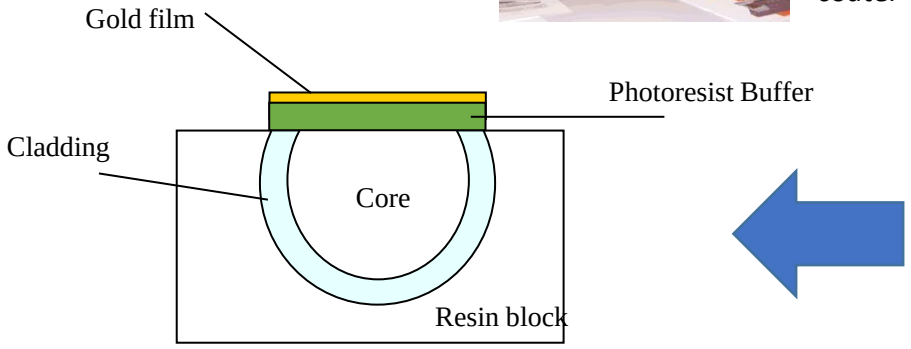


Spin coater

Sputter coater







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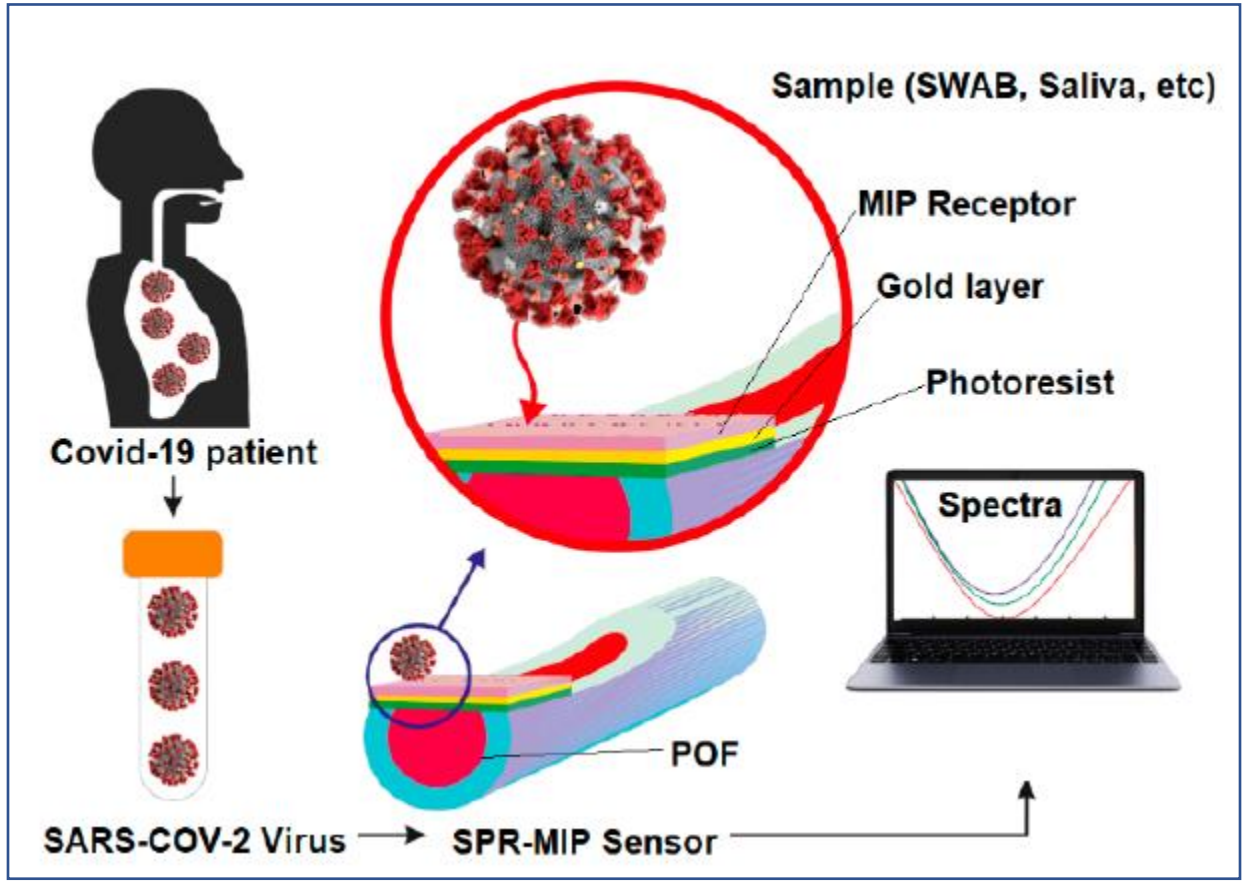
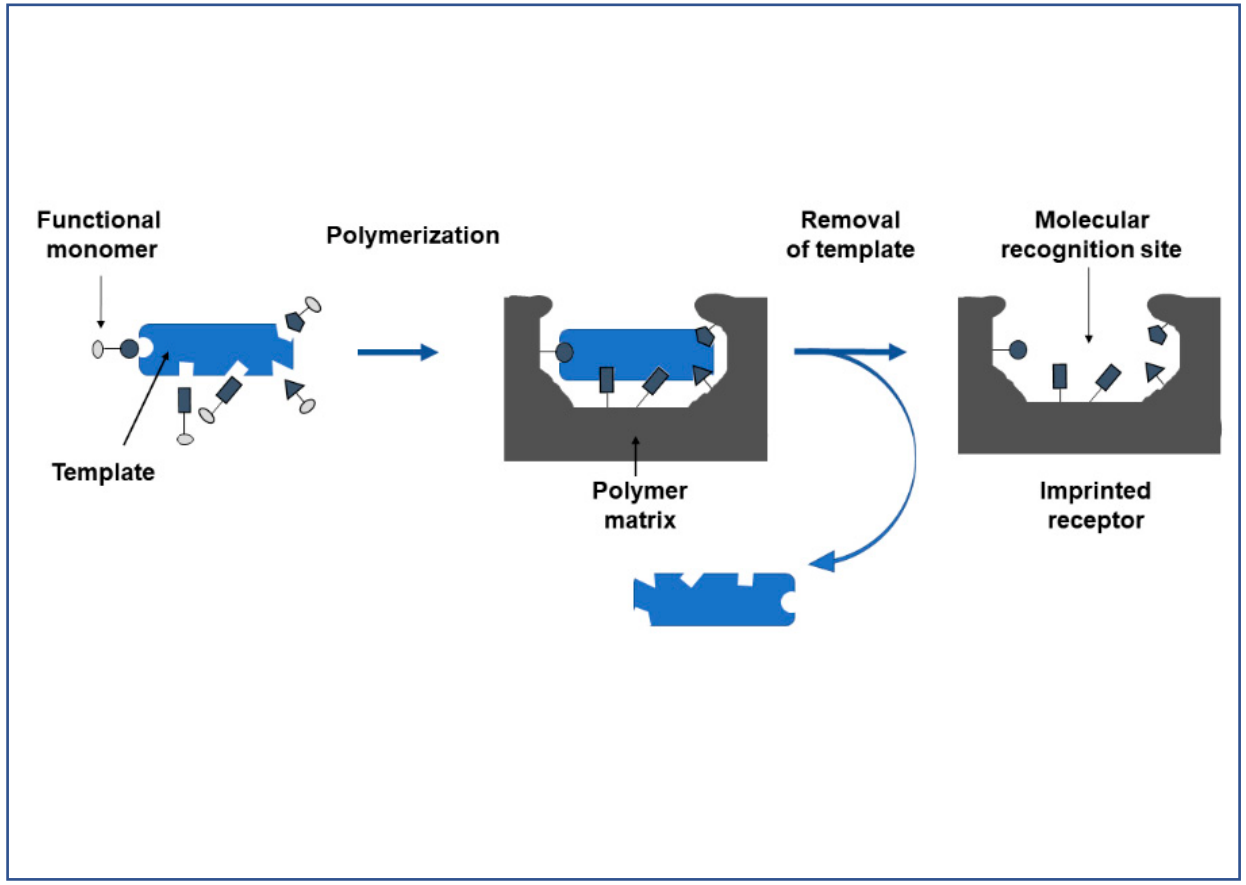
Molecularly Imprinted Polymer (MIP) for SARS-CoV-2 detection in acqueous solution



Outline of the Sensor for SARS-CoV-2 detection in different acqueous matrices.



Schematic representation of the MIP synthesis process.

Nunzio Cennamo *et al* "Proof of Concept for a Quick and Highly Sensitive On-Site Detection of SARS-CoV-2 by Plasmonic Optical Fibers and Molecularly Imprinted Polymers", *Sensors* **2021**, vol. 21(5), p. 1681. https://doi.org/10.3390/s21051681

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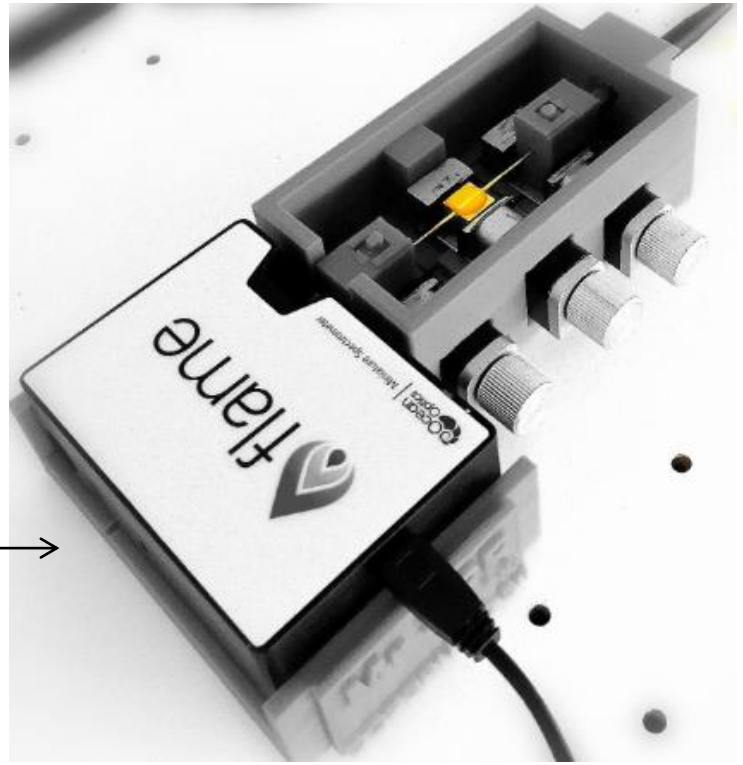
Experimental setup

Software

Spectrum analyzer

(200 ÷ 850 nm or 300 ÷ 1050 nm)



White Light Source
(360 ÷ 2000 nm)

SMA connectors

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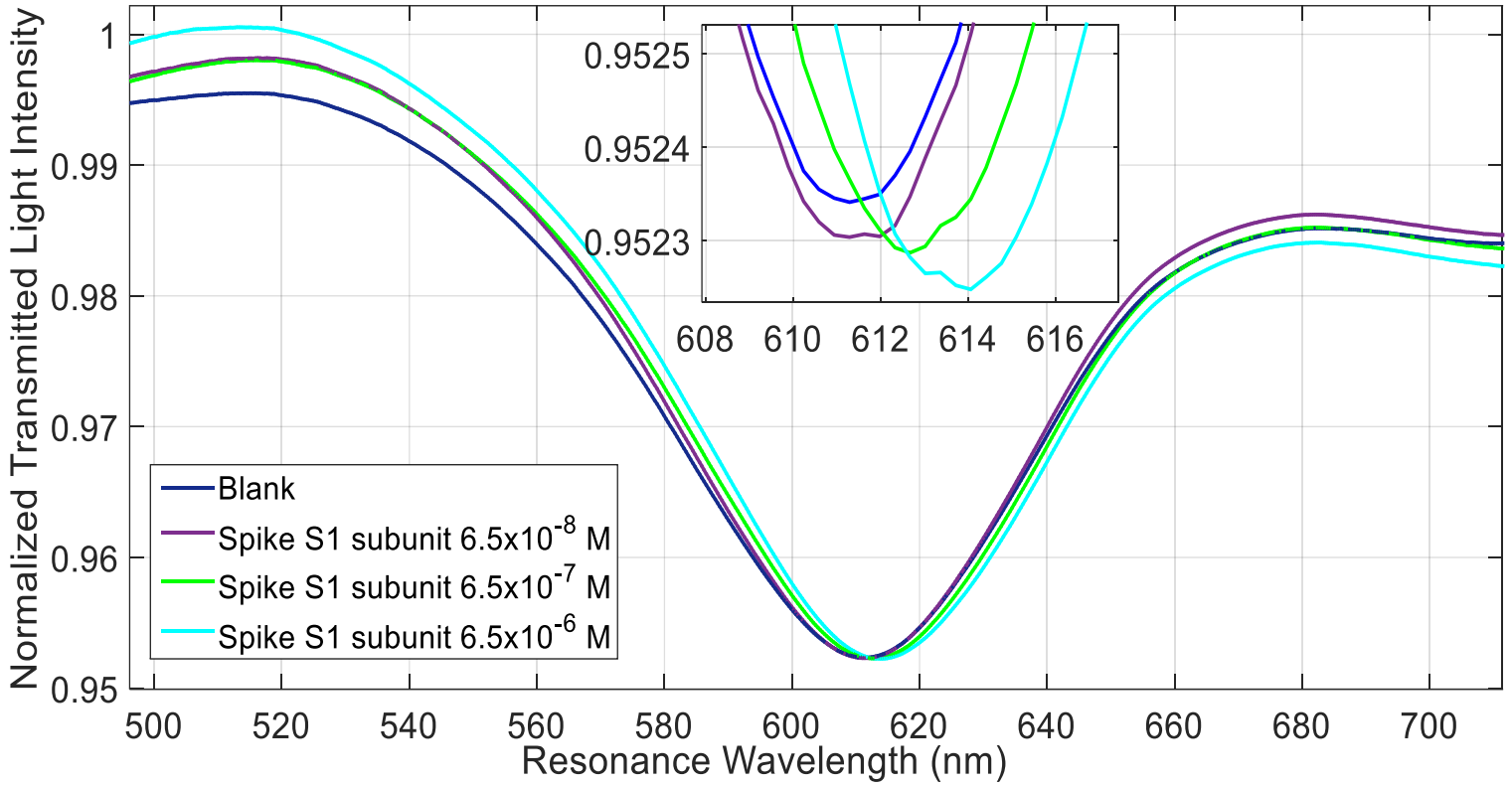
Experimental results

Preliminary binding test with S1 subunit of SARS-CoV-2 spike protein



Response curves of different concentrations of SARS-Cov-2 Spike S1 subunit.

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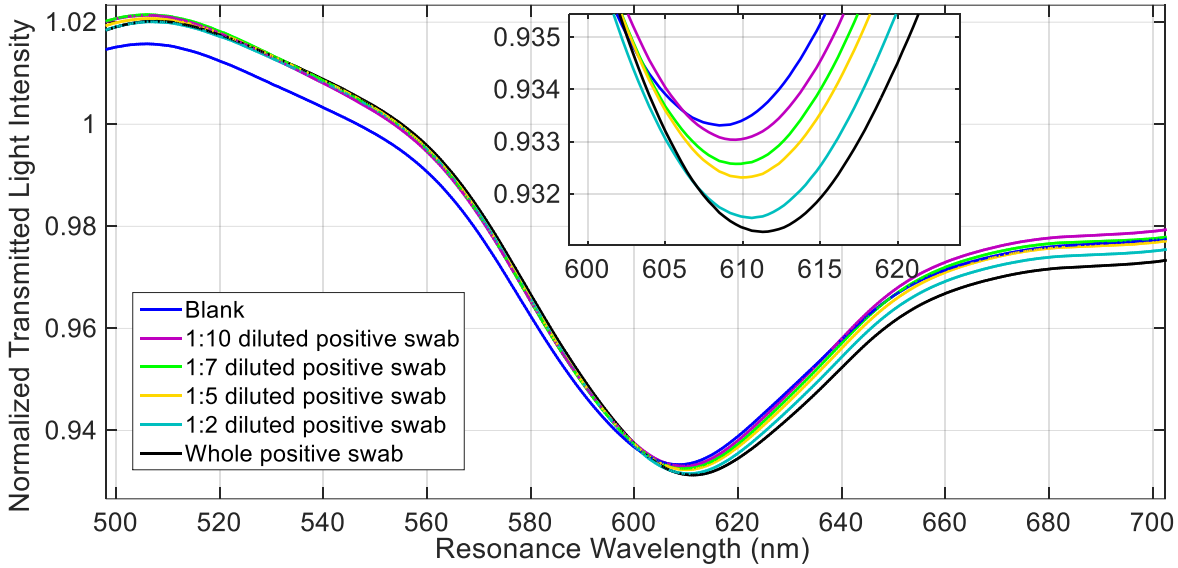
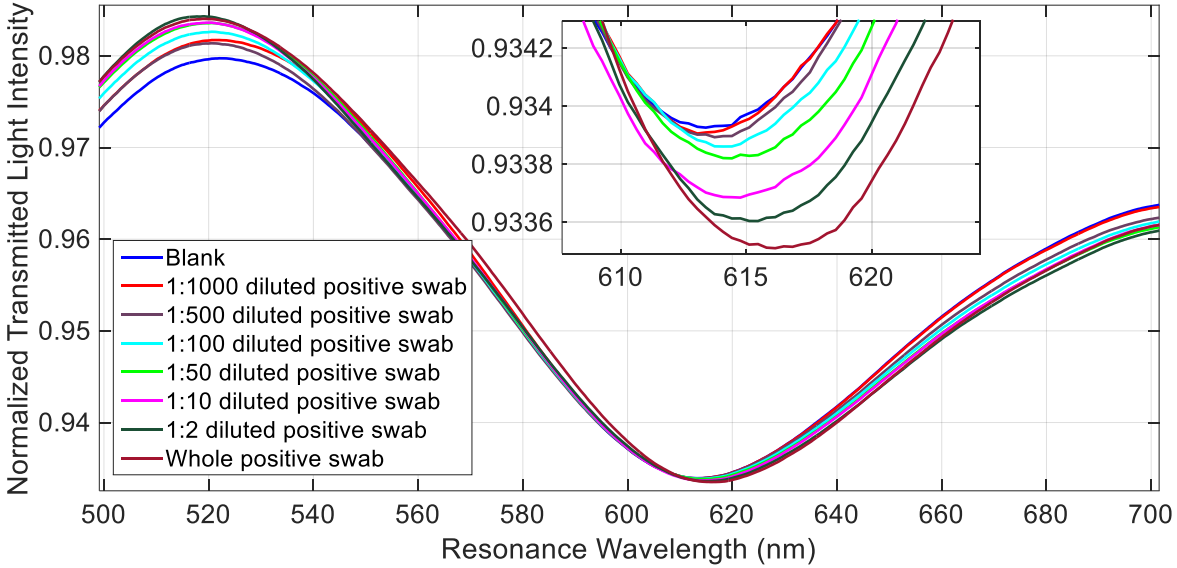
Experimental results

SARS-CoV-2 detection in real nasopharyngeal swabs



Response curves of different dilutions of a SARS-CoV-2 Positive swab (36th RT-PCR cycle) collected in UTM, tested with SARS-CoV-2 MIP-sensor. Physiological solution was used to make dilutions.



Response curves of different dilutions of a SARS-CoV-2 Positive swab (36th RT-PCR cycle) collected in physiological medium, tested with SARS-CoV-2 MIP-sensor. Physiological solution was used to make dilutions.

Nunzio Cennamo *et al* "Proof of Concept for a Quick and Highly Sensitive On-Site Detection of SARS-CoV-2 by Plasmonic Optical Fibers and Molecularly Imprinted Polymers", *Sensors* **2021**, vol. 21(5), p. 1681. https://doi.org/10.3390/s21051681

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Prospects and Conclusions

A plasmonic sensor based on D-shaped POF and MIP for SARS-CoV-2 detection has been reported.

Tests on real nasopharyngeal swabs in two different matrices (UTM and physiological solution) in order to investigate the sensitivity in both media, were reported.

These preliminary results demonstrated the effectiveness of the proposed sensing approach in detecting the virus in real samples within few minutes, making this kind of sensor a promising tool for a more rapid, cost-effective detection system in diagnostics.

Thank you for your attention

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