

Low-cost, multi-analyte plasmo-photonic sensor for faster, on-the-spot food quality & safety controls



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"The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101007448"



PHOTONICS²¹

Photonics Public Private Partnership

www.photonics21.org

Project Facts

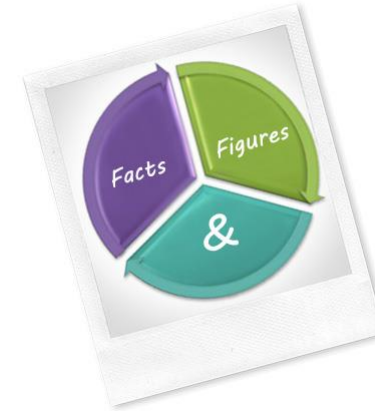
Start date: 01/01/2021

Duration: 42 moths

Funding: ~€ 5,000,000

Partners: 14

Countries: 8



Current status: Preliminary prototype ready and tested in lab.
New version end of 2022

Project website: www.graced.tech

Consortium



System integration & cloud platform experts



Academia and Research



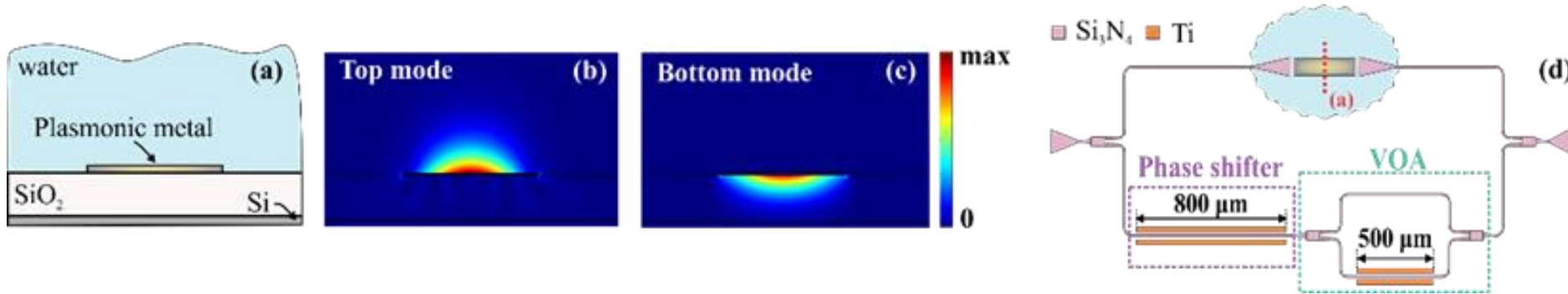
Food industry representatives



Photonic biosensors SMEs

Objectives - Main expected outcomes

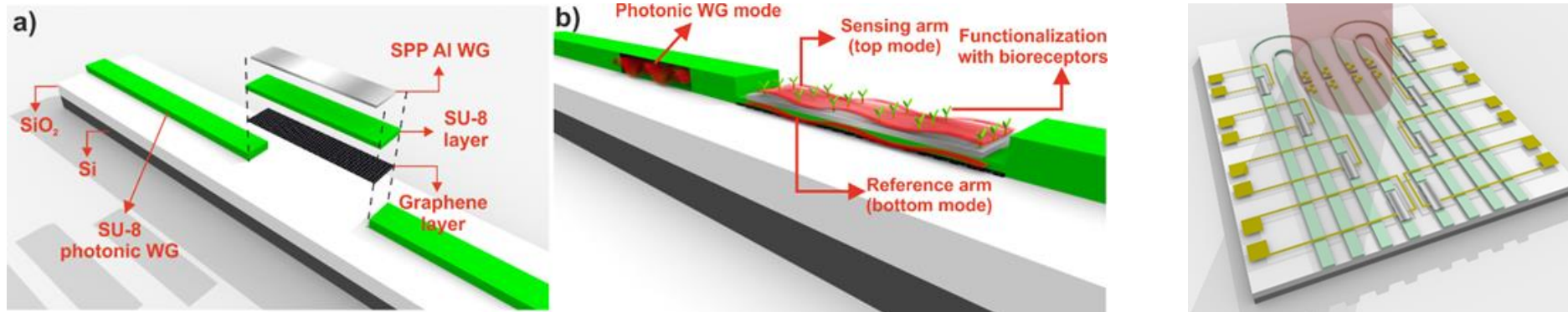
1. Novel **ultra-compact, cost-effective, plasmo-photonic bimodal sensor** platform with on-chip light generation suitable for farm-to-fork applications (focus on F&V).



Starting point: The sensor structures rely on a liquid-cladded plasmonic stripe waveguide (Figure a). Up to now such plasmonic waveguide was incorporated in the sensing arm of a SiN-based MZI (Figure d)

The GRACED sensor

GRACED



- ❑ High density integration: Up to 100 sensors per chip
- ❑ Wafer - level fabrication: High - volume production
- ❑ Cost-effective kit simultaneously detecting 7 analytes of interest

The GRACED sensor

ADVANCED SEARCH

Journals & Magazines > Journal of Lightwave Technology > Volume: 39 Issue: 15 ?

Theory and Sensitivity Optimization of Plasmo-photonic Mach-Zehnder Interferometric Sensors

Publisher: IEEE

[Cite This](#)

[PDF](#)

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<https://zenodo.org/communities/graced>

Objectives - Main expected outcomes

2. The **GRACED sensing devices** to cover different application requirements (reusability, multi-modality, connectivity)

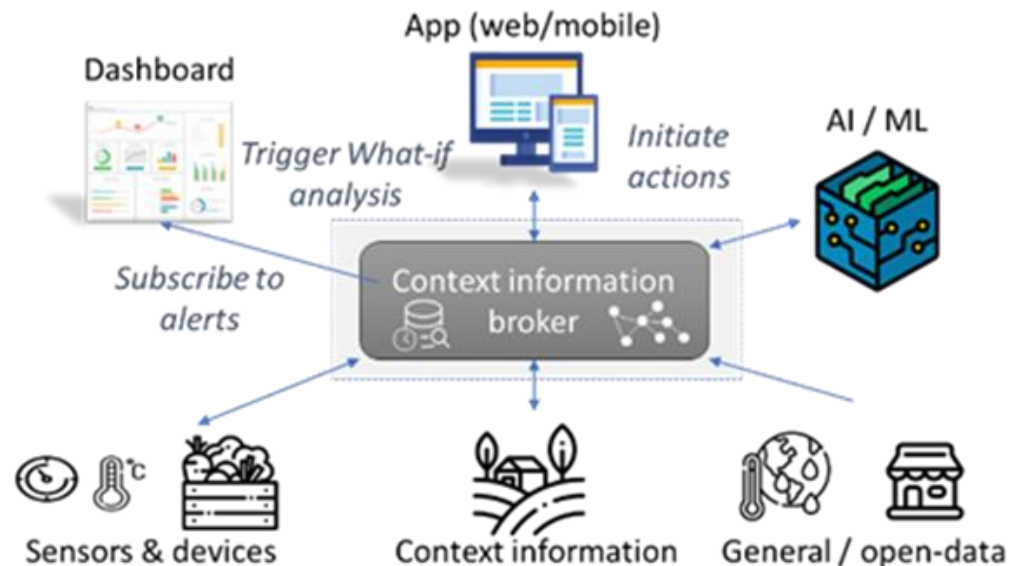
PROTOTYPE (1) a portable instrument for analysis of all types of samples

PROTOTYPE (2) autonomous sensing node for unattended field measurements, particularly useful for production systems that foresee minimum human intervention (such as vertical/urban farming)

Objectives - Main expected outcomes

3. Develop the **data analytics and sDSS platform** to enable photonic-driven applications

Implement a microservice architecture where a context information broker allows sharing of semantically enriched information across different services



Objectives - Main expected outcomes

4. Validate the complete approach and its impact through **real-world pilots**

5. Demonstrate the application-driven nature of the project and its impact in the **EU farm-to-fork strategy implementation**

- Four use cases covering different scenarios of:
 - food production by small/medium-sized farms
 - novel types of food production (urban farming and greywater reuse)
 - on-site food processing and vending (in-situ restaurants, on-site vending)
- Improve food yield, food quality & safety. Reduce food waste
- Sustainable, eco-friendly production and safe consumption of food for farmers and consumers

The GRACED solution



GRACED instrument

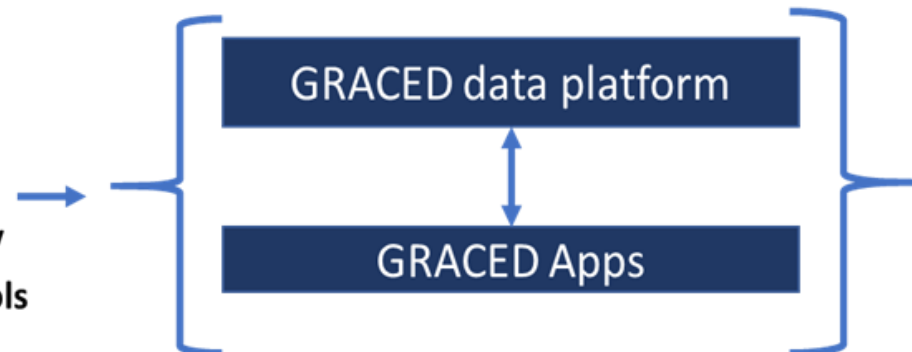
- 50x50x30 cm
- Analysis time: 20 min
- Production cost per (multi-parameter) sensor: 2-8€
- Suitable for all types of samples (liquid, solid)

GRACED IoT node

- 30x20x20 cm
- Analysis time: 25 min
- Production cost per (multi-parameter) sensor: 2-8€
- Suitable for liquid samples only
- Fully automated, on-line sensing (no human intervention for sampling)

Input from

- GRACED devices
- 3rd party data (i.e. meteo)
- Manual or ERP input on product/ production and additional controls



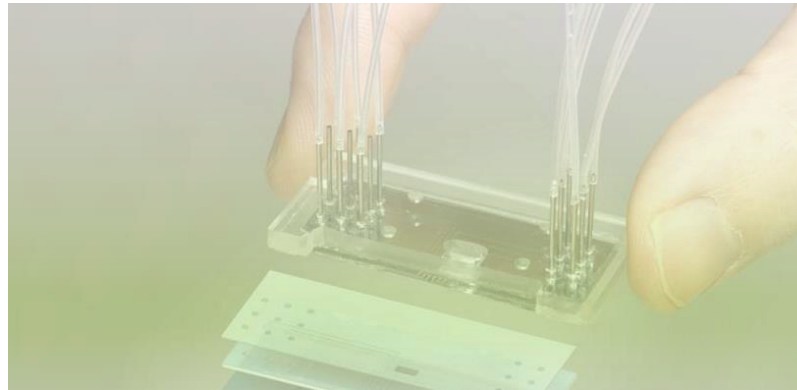
- Product lifetime quality monitoring
- Traceability
- Faster & more effective controls and support of EFSA assessments
- Support for automated product quality certification



For more information:

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www.graced.tech



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