



Ambrosia

“A multiplexed plasmo-phonic biosensing platform for rapid and intelligent sepsis diagnosis at the point of care”

Newsletter No 1 – June 2024



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AIM:

- ✓ AMBROSIA aims to provide the foundations for a multi-sensing future-proof Point of Care Unit for sepsis diagnosis offered by a CMOS compatible toolkit and enhanced by on-chip photonic neural network technology to provide an accurate and rapid diagnosis.

OBJECTIVES:

- ✓ Develop high-sensitivity and noise-resilient ultra-compact CMOS plasmo-photonic sensors.
- ✓ Deploy an InP-on-Si₃N₄ cost-efficient integration platform through micro-transfer printing (μ TP).
- ✓ Develop and demonstrate multi-channel label-free plasmo-photonic sensors for sepsis diagnosis.
- ✓ Develop an AI-based electro-optical read-out system for real-time sepsis detection and classification exploiting ultra-low power photonic Deep Neural Networks (DNNs).
- ✓ Develop a Point-of-Care sepsis diagnostic and classification system.
- ✓ Validate experimentally label-free and real-time sepsis detection and classification.

EXPECTED OUTCOME:

- ✓ Multi-channel plasmo-photonic sensor platform.
- ✓ Active-Passive Si₃N₄ Integration Technology.
- ✓ Micro-Transfer Printed Lasers on SiN.
- ✓ Photonic Deep Neural Networks for Diagnostics.
- ✓ Pluggable Electrically Interfaced Plasmo-Photonic Module.
- ✓ PoC System with Plasmo-Photonic Sensing for Sepsis Diagnosis.
- ✓ Multi-Channel plasmo-photonic Sepsis sensor platform.

News from the project

The multiplexed analysis of sepsis-related protein biomarkers and pathogenic bacteria will be carried out in a few minutes with the AMBROSIA's multi-sensing PoC platform, targeting the successful experimental classification into four different sepsis stages (No Inflammation, Inflammation, Sepsis and Septic Shock). The AMBROSIA project had a significant progress over the last year. The partners from the Consortium had the opportunity to meet several times, discuss the arising issues and find the most applicable solutions allowing the progress of the project.

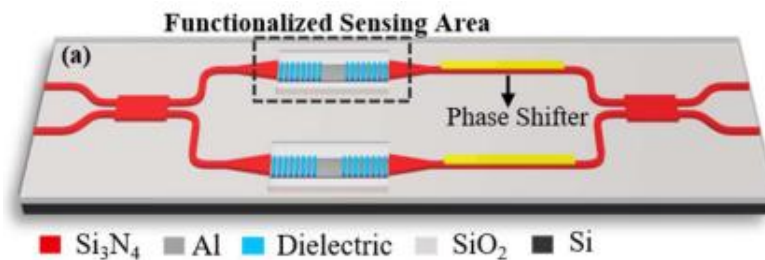


Figure 1: Plasmophotonic MZI sensor with Bragg-grating-decorated Aluminum plasmonic stripe waveguides in both arms.

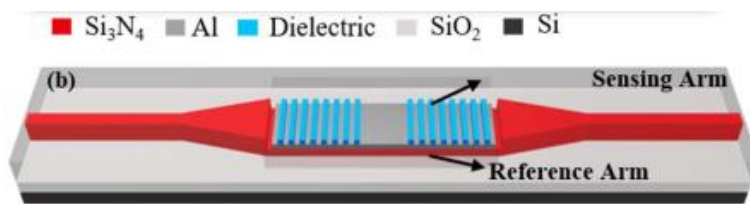


Figure 2: Plasmophotonic single-arm bimodal interferometric sensor.

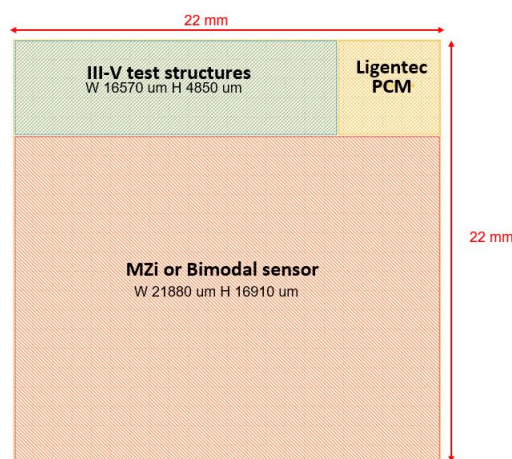


Figure 3: Conceptual layout of the AMBROSIA 1st run photonic chip showing the 3 different areas.

During the first year, the design and simulation analysis for the proposed plasmophotonic sensor configurations (MZI (Fig. 1) and bimodal (Fig 2)), and active devices (i.e. lasers and photodetectors) were finalized, leading to the design of the final integrated circuits and the mask for the photonic chips of the 1st fabrication run (.gds files) which will be fabricated by LGT, UB, SMART and XCEL. The first chips are expected by the beginning of June 2024. Figure 3 presents the photonic chip layout. Its size is 22 mm x 22 mm and it includes three sections: (i) the sensors area with MZI and bimodal variants (ii) the active area including the active InP elements, and (iii) the LGT quality control area.

including the active InP elements, and (iii) the LGT quality control area.

Consortium meetings

✓ Kick-off meeting

The AMBROSIA kick-off meeting took place in Thessaloniki during Monday 06 - Tuesday 07 February 2023 (Fig. 4). Representatives of the consortium gathered in Thessaloniki in a highly inspiring atmosphere and successfully launched



Figure 2: AMBROSIA kick off meeting.

the project's activities. A roadmap for the first six months was drafted.



Figure 3: AMBROSIA 6M meeting.

✓ 6M project meeting

Ambrosia M6 consortium meeting was hosted on 20-21 June 2023 in Ioannina, Greece (Fig. 5). The progress of the project was confirmed and critical decisions were made.



Figure 4: AMBROSIA 1st review

✓ 1st review meeting

The 1st review meeting of AMBROSIA project was held successfully on 24th of October 2023 via teleconference (Fig. 6). The progress of the project during the first 10 months was confirmed and critical decisions were made.



Figure 5: AMBROSIA 12M meeting.

✓ 12M project meeting

The AMBROSIA partners met in Barcelona, Spain during a two-day meeting on 7-8 March 2024 organized by ICN2 (Fig. 7). All partners had the opportunity to present their work and discuss progress and issues. A comprehensive plan for the next six months was also mentioned, before

the partners meet again for the next review meeting in October 2024.

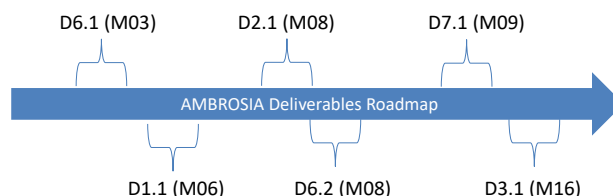


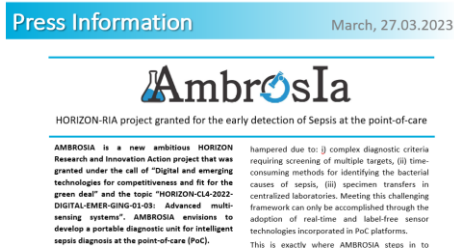
Figure 8: AMBROSIA Deliverables Roadmap

✓ Planned events:

The next AMBROSIA review meeting is scheduled as a physical meeting for the October 3rd, 2024, in Brussels.

Dissemination activities

✓ First AMBROSIA press release



✓ First AMBROSIA leaflet



✓ Second AMBROSIA press release



✓ AMBROSIA video



You can watch the video on YouTube:

<https://www.youtube.com/watch?v=GSyXR0-G1MI>

✓ 1st AMBROSIA journal publication

K.Fotiadis, E. Chatzianagnostou, D. Spasopoulos, S. Simos, D. V. Bellas, O. Bhalerao, S. Suckow, A.L. Schall-Giesecke, M. Lemme, J.C. Weeber, P. Das, L. Markey, El. Lidorikis and N. Pleros, "A High-Sensitivity Bi-modal Plasmophotonic Refractive Index Sensor", in ACS Photonics Journal, vol. 10, no. 8, pp 2580-2588, August 2023.

✓ 1 oral presentation at CLEO conference 2024

K.Fotiadis, L. Damakoudi, S. Simos, E. Chatzianagnostou, D. Spasopoulos, D. V. Bellas, O. Bhalerao, S. Suckow, M. Lemme, El. Lidorikis and N. Pleros, "Single-arm Interferometric Plasmonic Sensor integrated on a cladded polymeric photonic platform", presented at CLEO 2024, Charlotte, North Carolina, USA.

✓ 2 poster presentations at META conference 2024

S. Simos, L. Damakoudi, E. Chatzianagnostou, K. Fotiadis, D. Spasopoulos, D. Bellas, O. Bhalerao, St. Suckow, M. Lemme, K. Vyrsoinos, N. Pleros, "Self-referenced integrated plasmophotonic sensor for temperature compensated refractive index sensing measurements", to be presented in META 2024, Toyama, Japan.

L. Damakoudi, S. Simos, K. Fotiadis, D. Spasopoulos, E. Chatzianagnostou, O. Bhalerao, St. Suckow, M. Lemme, E. Lidorikis, N. Pleros, K. Vyrsoinos, "High-sensitivity integrated plasmophotonic temperature sensing platform", to be presented in META 2024, Toyama, Japan.

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The consortium





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