Press Release

EU-Funded Project 'Next-2Digits' Boosts Graphene Expertise and Knowledge Sharing within the European Union

In October, a new Horizon Europe funded project started. With a consortium of 11 partners from 8 different countries, the Next-2Digits project aims to develop the next generation of sensors and imagers enabled by 2D materials digital integration.

Coordinated by the National Technical University of Athens, Next-2Digits benefits from the presence of well-reputed academic, research and industrial teams, whose areas of work span from graphene and 2D materials synthesis, characterization, manipulation, and integration, as well as in the fields of photonics, material science, application-based integration technologies and validation.

Next-2Digits will run for 3 years and 3 months.

Next-2Digits is also collaborating with the GrapheneEU project “Europe in the Lead Coordination and Support Action”. Developed under the scope of the Graphene Flagship Initiative, which is the European Union-funded research and innovation endeavour that aims to bring graphene and related materials from the laboratory to the market, this partnership provides a platform for collaboration, coordination and support for the Graphene Flagship core projects and associated members.

Along with the GrapheneEU, Next-2Digits will contribute to increase the expertise in the graphene field and to spread knowledge among various stakeholders.

Funded by the European Union

This project has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101120651.

What is Next-2Digits about?

Photodetectors (PDs) and modulators (MDs) are essential components of Photonic Integrated Circuits (PICs) and Optoelectronic Integrated Circuits (OEICs).

The introduction of Graphene and other two-dimensional materials (2DM) in the pallet of the compatible materials to the PIC and OEIC industry has offered a novel paradigm in integrated PDs and MDs with miniature footprint and ultrawide bandwidth, outperforming the standard materials and architectures. The main challenge, when graphene is deposited, is the introduction of the impurities and defects, especially when polymers and solvents are involved. This degrades the performance of devices, often drastically.

Next-2Digits will tackle these challenges and introduce the direct wafer-scale integration of graphene in PICs using two additive technologies:

i. semi dry transfer of Graphene layers for full wafer scale integration and direct die processing, and

ii. Laser Digital Transfer (LDT) of intact 2DM pixels directly on the stack and without the need of any post-processing.

In this way, relevant interfaces will be largely defect-free with high carrier mobilities and large bandwidths, enabling thus the advent of the next generation of integrated PDs and MDs. In addition, the proposed technology, being one-step and free of chemical processing, will have significant advantages in terms of cost, material, and energy saving, and reduced resulting waste.

Next-2Digits envisions to develop the first hybrid Graphene-based PDs and MDs which will be integrated in three device demonstrators:

1. A miniaturized LiDAR with an integrated graphene photodetector will be validated at TRL5 in an Unmanned Aerial Vehicle (UAV) to fulfil the requirements of long flight times and minimal energy consumption in advanced geo-mapping.

2. A PIC greenhouse gas sensor with sensitivity below 50ppm and miniaturized footprint offering multi-sensing capability. The PIC-based sensor device will be validated at TRL5 in two types of biogas plants.

3. An on-chip polarization diversity receiver (PDR) offering extended bandwidth and high resolution will be used for biomedical optical coherence tomography (OCT) imaging in a cardiovascular application and compared against currently available receivers.

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The Consortium:

Partner Name	Short name	Country
1. National Technical University of Athens	**NTUA**	Greece
2. Graphenea Semiconductor S.L.	**GSEMI**	Spain
3. Ommatidia Lidar S.L.	**OMMA**	Spain
4. Silex Microsystems AB	**SILEX**	Sweden
5. Senseair AB	**SENSE**	Sweden
6. YellowScan	**YSCAN**	France
7. Linköping University	**LIU**	Sweden
8. Bert energy GMBH	**BERT**	Germany
9. VTT Technical Research Centre of Finland	**VTT**	Finland
10. AMIRES s.r.o.	**AMI**	Czech Republic
11. Gooch & Housego (Torquay) Ltd.	**G&H**	United Kingdom

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