AMUSENS

Multi-pixel gas sensor platform

FOR A WIDE RANGE OF APPLIANCE AND CONSUMER MARKETS

Funded by the European Union

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About

Gas sensors are crucial in the personal and industrial monitoring to analyze personal exposure to air pollutants or to critical gases, to control product quality such as in the food industry, and in health care by analyzing gases from human body. These applications require miniaturized low power and low-cost gas sensors with good gas selectivity to be integrated in personal devices, in product packaging or in widely distributed sensor networks. AMUSENS aims at developing a gas sensor platform with flexible selectivity to different gas environments by combining a multi-pixel approach and artificial intelligence to adapt the data analysis to the targeted applications. It is based on metal oxide sensing materials on micro-hotplate platform, which are already available on the market for low power applications, but suffer from a lack of selectivity. Gas-selective multi-pixel sensors based on different metal oxide materials have been demonstrated, but their industrialization is limited to few industrially available materials. By using original additive manufacturing approaches for local liquid-phase and gas-phase depositions, we aim at extending the choice of available materials and demonstrate their sustainability in wafer-scale processing. Artificial intelligence will be used both to accelerate the choice of materials and for data fusion to determine specific patterns in the gas analysis. Two specific applications targeting personal exposure and health care will demonstrate the adaptability of the platform, based on an analysis of the users‘ requirements.

Vision

AMUSENS is focused on the development of a new adaptable gas sensor platform as well as a new manufacturing method of such platform by combining on-demand gas sensor material selection and additive manufacturing for the on-demand fabrication of dedicated sensors (small scale foundry). Within the gas sensor market, the consumer and appliances markets show the highest growth potential in the coming years, currently limited by the lack of high-performance devices. Microelectronic leaders in Europe are already well established in the gas sensor market and will directly benefit from AMUSENS's new standards in low-cost and low-power gas sensor fabrication in the view to comfort European leadership in this exploding markets.

Motivation

The concept of multi-pixel gas sensor and AI-assisted sensor data analysis have been widely studied in the laboratory, but their commercialisation suffers from several challenges. Commercial products based on the multi-pixel approach do not show selectivity improvement as compared to single sensors, while multi-sensors integrating AI are restricted to odour recognition. Moreover, the current fabrication methods limit the concept of multi-pixel sensor to very specific combinations of materials with very low degree of adaptability.

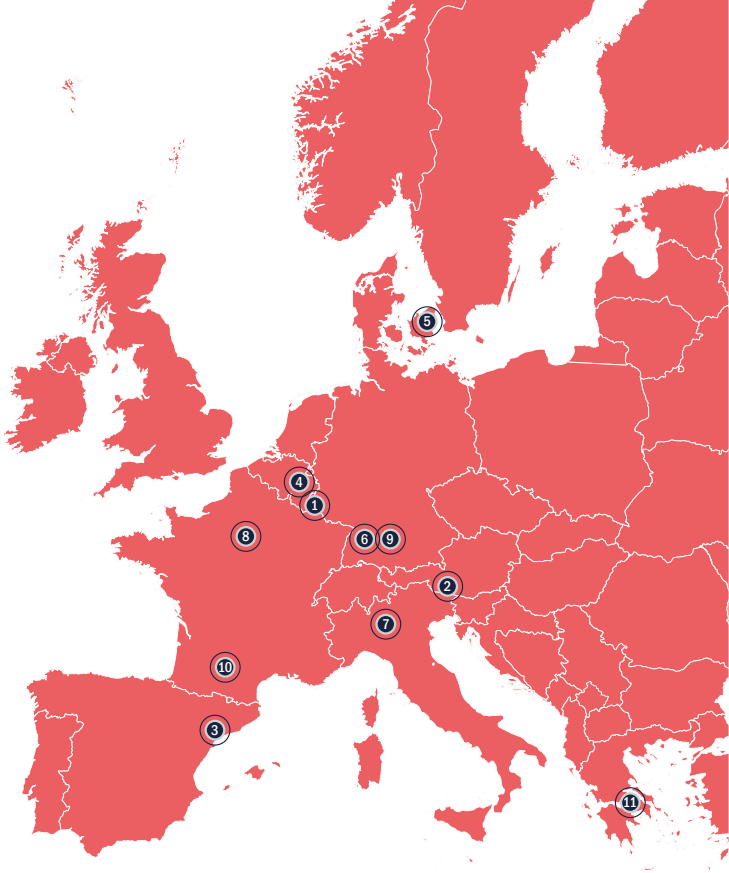
Mission & Objectives

The main objective of AMUSENS is to develop a low-power gas sensor platform with adaptable selectivity to different gas environments by combining metal oxide (MO) multi-pixel sensing approach and trained artificial intelligence (AI), and to demonstrate the adaptability to two user case applications chosen in the fields of personal environmental monitoring and health care.
This approach will circumvent most of the current limitations indicated above.

- Using innovative and sustainable additive manufacturing approaches, AMUSENS aims at demonstrating efficient large-scale production of multi-pixel gas sensors based on a wide variety of MO nanostructures as sensing materials, while drastically reducing material consumptionand waste thanks to localized deposition.
- AMUSENS will take the advantage of AI first as a screening method for sensing materials to be used in the muti- pixel sensing platforms upon envisaged gas compositions given by the targeted applications (environmental monitoring and health care). By combining this selection with the local deposition techniques, AMUSENS will demonstrate a methodology to provide a viable way to produce multi-pixel sensors with on-demand material combinations, thus accelerating the time to market of gas sensors with specific properties.
- AI will also be used to process signals from the various gas sensing pixels and extract specific patterns characterizing training environments defined by the targeted applications.
- At last, advanced data treatment and training will compensate variations between different batches and evolutions of the sensing material within the sensor lifetime.

Partners

The AMUSENS consortium has all the components for a successful project. Ten partners from eight different countries (Austria, Belgium, Denmark, France, Germany, Italy, Luxemburg and Spain) will provide their extensive know-how and long-lasting experience for the development of the new gas sensor platform.



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Institut Mines-Télécom
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Sciosense Germany GmbH
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10

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Institute of Communication & Computer Systems ICCS
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Facts

Budget

€ 8 Million
100% EU-funded

Consortium

11 Partners
9 Countries

Duration

48 Months
06/2024 - 05/2028

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