PROJECT PROFILE

16113

Low-cost sensor technologies for measuring and monitoring air quality will impact health, societal and environmental issues [ESAIRQ]

Driven by a growing demand for sensors and the potential of using semiconductor technologies in this application space, the Environmental Sensors for Air Quality (ESAIRQ) project focuses on developing essential technologies for gas sensing, while researching selective, sensitive and reliable sensors at affordable costs for mass exploitation. ESAIRQ's deliverables, notably its gas, fine-particle and pathogen-sensing technologies, will have a significant health, societal and environmental impact.

Society is paying increasing attention to air quality since air pollution is growing and its negative impact understood, thanks to publications and environmental regulations. Importantly, with more and more highly isolated buildings, indoor air exchange is limited and the monitoring and control of air quality will be crucial. This is especially true since formaldehyde emissions from furniture and new building interiors, as well as volatile organic compounds (VOCs), are becoming a health hazard. The change in buildings and the awareness of health risks underscore the importance of monitoring environmental air quality. All of this, together with new applications, is triggering demand for sensors to measure air quality.

Researching and developing sensor technologies for mass gas-sensing

With the growing demand for sensor technologies and the potential of semiconductor technologies in this application area, ESAIRQ aims at further developing essential technologies for gas sensing with research in selective, sensitive and reliable sensors at affordable costs for mass exploitation. The miniaturised sensor technologies developed in this project will be key enablers for creating sensor networks for air-quality monitoring which can be formed either by embedding sensors in the basic infrastructure, or even in mobile devices. The gas, fine-particle and pathogen-sensing technologies will have a significant impact on measures based on known air-quality and composition.

The realisation of low-cost, affordable sensors that fulfil the requirements of size, sensitivity, selectivity and lifetime will need to deal with technological challenges to:

- Increase the selectivity of sensors, especially to particle matter and polluting organic and inorganic gases when offered as gas mixtures;
- Miniaturise in the functional integration of, for example, emitters and detectors or circuits needed to control absorption and desorption;
- Profit from cost and quality advantages of the semiconductor process-technologies for high-volumes and low-cost compatible processes which will be developed;
- Enable low-power integration of sensors in connected solutions, and establish services.

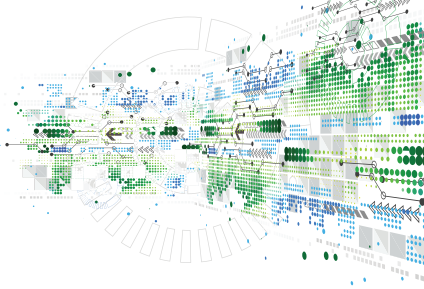
With the planned research, ESAIRQ aims to realise:

- Miniaturisation and functional integration of infrared spectral sensors;
- Functional integration on a chip-level, leading to decrease in power consumption;
- Miniaturisation of fine-particle sensing/fire detection;
- Functional integration of thin membrane layers and sandwich-layer structures, together with innovative gas-sensitive layer systems;
- Sensor arrays and control algorithms leading to selective gas sensors;
- A miniaturised device for airborne pathogen detection.

Societal, economic and environmental impacts

ESAIRQ will develop essential technologies for gas sensing, focusing on research in selective, sensitive and reliable sensors at affordable costs for mass exploitation. These miniaturised sensor platforms developed in this project are key enablers for highly sensitive and selective sensor-systems or sensor-networks for air-quality monitoring.

The mobile gas and fine-particle sensing platforms will have a significant societal impact in reducing mortality rates and health-care costs in polluted environments. In addition, results of the project will strengthen the European landscape in terms of sensor technologies, and manufacturing and application know-how. They will also generate new markets. Importantly, education and the drive for new start-ups will be supported by European-wide collaboration.



KEY APPLICATION AREAS

- Health & Well-Being
- Automotive and Transport (future)

ESSENTIAL CAPABILITIES

- Systems and Components Architecture, Design & Integration
- Connectivity & Interoperability
- Safety, Security & Reliability
- ECS Process Technology, Equipment, Materials & Manufacturing

PARTNERS

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COUNTRIES INVOLVED

- Czech Republic
- Finland
- France
- Germany
- Malta
- Netherlands
- Spain

PROJECT LEADER

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KEY PROJECT DATES

21 June 2018 to 20 June 2021

Future outlook looks promising

The market for environmental MEMS sensors was reported in 2015 to be worth $28 million and 35m units, and expected to reach $155m in 2021, with 256m units at a compound annual growth rate (CAGR) of 39% from 2015-2021.

Wearables are one of the platforms ripe for new sensor integration, and also a basis for new service offerings. The most significant market-analysis data was found for smart watches and glasses. Here, major growth rates were expected in 2015, when shipments were expected to increase from around 100m units, to around 200m in 2019. This high-growth rate indicates a highly attractive and competitive future market.

Demand for air purifiers in Asia is skyrocketing. The forecast for sensor shipments presented at the European MEMS Summit in September 2016 predicts high growth of over 5m units in 2021.

Finally, the hospital-acquired infections (HAI) diagnostics market is projected to grow to $83m by 2020, with a CAGR of 8.5%, mainly driven by public and government awareness which is pushing technological developments in this sector. The overall food pathogen testing market is expected to grow to $17.16 billion in 2021, with a CAGR of 4.6%. Even though this market is less demanding than the clinical one, commercialisation of biosensors for the food-safety industry is growing as legislation creates new standards for microbial monitoring. With quicker detection time and reusable features, biosensors will be important to those activities whose revenues can be affected by pathogen contamination.

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