

Development of carbon nanotube-based wireless gas sensors and applications in stored product protection and food safety

Project aims

NANOFUM aims to develop highly-evolved, smart gas sensors and cloud-based tools, to address specific safety challenges in sanitation and protection of stored commodities such as grains. Using innovations ripe for exploitation, combined with cutting-edge hardware and software implements, the partners will develop and roll out complete solutions for real-time monitoring and optimization of fumigation (pest management) for stored cereals, related amylaceous products and other high value durable commodities.

Objectives

- Refinement of Single-Wall Carbon Nanotube (SWCNT) highly efficient gas sensors and custom design for phosphine (PH₃), a versatile gas for stored product protection,
- Adoption of data analytics for achieving sensor precision and mitigating the accuracy limitations of sensing elements (cross-sensitivity, non-linearity),
- Providing access to sensor data through mobile-friendly cloud apps, which shall be designed specifically for professionals in the Food & Beverage, Food Safety and Pest Management sectors,
- Developing an end-to-end, holistic solution using best in class Internet of Things building blocks and service deployment paradigms.

Project Partners



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NANOFUM aims to bring to the global market highly-evolved, smart gas sensors and cloud-based tools, address specific safety challenges in sanitation and protection of stored products and especially foods.



Technical Activities of NANOFUM



To achieve this, **NANOFUM** will:

- promote the use of the new technologies developed within the project to support new lines of sensor devices and systems, also in diverse novel application fields
- promote the comparative evaluation of the potential of SWCNT gas sensors within the European research community, and
- increase awareness on the potential of the SWCNT-based gas sensors integrated network technologies developed within the project in a wider public audience.

Implementation

The **NANOFUM** is organised into five Work Packages (WPs) designed to address the NANOFUM technical objectives, plus WP5 (Management and Communications, Exploitation). More specific:

- The first Work Package is about the Optimization and prototyping of SWCNT-sensors,
- The second Work Package about the Software developments,
- The third Work Package about the Characterization, testing, certification,
- The Fourth Package about Field Evaluation of sensors and
- The Fifth Work Package about Management and Communication.

Impact

NANOFUM meets the impacts expected as follows:

Provide novel technological means for achieving real-time monitoring and traceability of fumigants and other gases in stored products, with the goal of fully controlling product condition, risk of infestation and spoilage. Current methods are often based on outdated tools, or no monitoring at all, thus being prone to human error, waste, safety hazards to people and ecosystems. The proposed technology can be a game changer in this environment, enabling real-time, cloud-based monitoring with efficient sensors that can be placed in locations previously not possible (e.g. packaging of grains). We believe that the results of the proposed project will have a great impact on how the fumigant is applied by launching the proposed sensor technology into widespread use by fumigators. By offering real-time monitoring through our evolved, always-on sensors, we shall offer objective means for enforcing proper phosphine treatment protocols.

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