17IND09 MetAMCII

Metrology for Airborne Molecular Contaminants II

Economic impact of MetAMCII project results

BACKGROUND

Airborne Molecular Contamination (AMC) in the form of chemical vapours or aerosols has an adverse effect on products, processes or instruments. Technological progress is driven by the ability to operate at ever smaller scales and with greater complexity, thus increasing the demand for lower AMC concentration measurement. Real time online monitoring is critical to ensure that corrective action is taken before this impacts on production costs.

Therefore, this project focusses on developing underpinning metrology focused on new ultra-sensitive spectroscopic techniques and high accuracy reference materials at extremely low concentrations for key AMCs. These developments are urgently needed in order to improve manufacturing processes and to control contamination. The aim is to increase industrial competitiveness, reduce down time and remove barriers to efficient manufacturing.

INTRODUCTION

As part of the MetAMCII research project several measurement techniques, i.e. NICE-OHMS, cantilever enhanced photoacoustic spectroscopy, CRDS and dTDLAS/WMS for ultra-sensitive continuous detection of hydrogen chloride (HCl) gas have been developed. Another main target for the project has been developing traceable static reference materials for HCl in nitrogen in the range of 1-10 µmol/mol with a stability of at least 1 year and an ambitious target uncertainty of better than 0.5% relative. Such reference materials are needed for the calibration of analyzers and quality control and currently no NMIs can supply these mixtures.

The developed techniques in the project are targeted for cleanroom applications, but they could be applied directly to many other applications[1] as well. Air quality and process applications are examples of other high-impact applications which require high sensitivity and good accuracy. The market of trace gas monitoring applications is vast and demands for measurement devices and their properties can differ considerably even within one application. Reference materials developed in the project can be used directly in any application requiring e.g. HCl calibration and the developed techniques can be used more broadly for improving existing reference material generation.

ECONOMIC IMPACT

Market size of cleanroom technology market is currently[2] between 4 to 5 billion (USD). However, contamination control measurement technology is only a small part of the whole market. Gasera estimates that the high-end measurement instrumentation market size is approximately 100 million EUR annually. We estimate that the technologies developed in the MetAMCII project could be have a market size of 3 million EUR in 2026 (+5 years) and 15 million EUR in 2031 (+10 years) in cleanroom sector. One of the key challenges in entering the market is to commercialize NICE-OHMS technology. NICE-OHMS is the most complex of the measurement technologies developed in the MetAMC2

[1] http://empir.npl.co.uk/metamcii/wp-content/uploads/sites/43/2020/03/MetAMCII_A3.2.3_LiteratureReview_20022020.pdf

[2] MarketsandMarkets™ and Grand View Research

project, but it also has a high ceiling as it is considered one of the most, if not the most, sensitive optical measurement technology.

The added value of the MetAMCII project can be also considered by evaluating the impact on other applications. One should consider that the development work done in MetAMCII was targeted for measuring and generating HCl, but the same techniques can be largely used in detecting and generating many other analytes as well. We estimate that techniques for detecting HCl developed in the project could be used effectively in applications such as emission monitoring (cleanrooms, chemical industry, process industry, …) and environmental monitoring with a potential market size of of 5 million EUR in 2026 (+5 years) and 25 million EUR in 2031 (+10 years).

Economic impact of the static reference materials in challenging to evaluate. The static reference materials will be provided by NPL and VSL after obtaining accreditation. Further, they will use these reference materials to provide certification services to customers. Besides in clean room monitoring, such reference materials will be used for emission monitoring from industry. The combined value of such services is estimated to be of 0.3 million EUR in 2026 (+5 years) and 1 million EUR in 2031 (+10 years).

CONCLUSION

The economic impact of MetAMCII project is discussed in this summary report. The impact is challenging to evaluate as some of the developed techniques are still in the research grade and despite the high ceiling of the techniques, the techniques still need to be refined and productized before they can enter the market. Moreover, the techniques developed in the project can be also used in other high-impact applications, such as in emission and environmental monitoring. by combining the estimated achievable market potential in cleanroom and in other key applications, we estimate that the market value is 8 million EUR in 2026 (+5 years) and 40 million EUR in 2031 (+10 years).