PRESS RELEASE

Indoor Air Under Scrutiny: Fraunhofer IMM Develops New Approaches for Emission Testing

We generally feel safe at home. It is where we have designed our surroundings according to our preferences and chosen products to the best of our knowledge. But can we truly be sure that these products pose no threat to our health? In the EU-funded project MetrIAQ, Fraunhofer IMM collaborated with several national and international partners to develop novel microcapsules as reference materials for quality assurance in emission testing for the health evaluation of building products.

Indoor air quality has a significant impact on our health and well-being. People spend up to 80% of their time indoors, making a healthy indoor climate essential. So-called volatile organic compounds (VOCs) are invisible, potentially hazardous substances. They are mainly released when solvents evaporate and liquid or paste-like products dry but can also be emitted from solid products such as plastics. Even materials of natural origin can release VOCs into the surrounding air (e.g., terpenes from wood). Under certain environmental or occupational conditions, these emissions can irritate the sensory organs and cause health complaints often associated with Sick Building Syndrome. Emission levels may be elevated in new or renovated buildings when improved energy-saving measures, such as tighter building envelopes, reduce air exchange with fresh outside air.

Reliable Emission Testing Requires Reference Materials

How can consumers be sure that the paints, varnishes, and furniture they use indoors pose no health risks? While a global network of professional laboratories conducts emission testing to assess indoor products, test result comparability must be ensured. The emission chamber test method in accordance with ISO 16000-9 and EN 16516 includes several steps, from sample preparation to air sampling from the test chamber and gas chromatographic analysis. Professional quality assurance and control require well-characterized Emission Reference Materials (ERMs) that release a known quantity of VOCs into the test chamber, simulating real samples. However, such reference materials are currently not commercially available.

Fraunhofer IMM Develops Innovative ERMs

Until now, comparative measurements have often used reference materials based on conventional building materials, such as paints or flooring. These often yielded highly inconsistent results.

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In previous interlaboratory trials where different labs tested the same materials, measurement results varied significantly—by up to 300% in some cases. One reason was the instability of the reference materials used so far, whose emission rates changed over time or lacked sufficient homogeneity.

Fraunhofer IMM has developed innovative capsule systems that emit defined quantities of VOCs commonly found in indoor air, such as limonene, pinene, and toluene. The capsules feature a semipermeable polyurethane/polyurea shell. Their spherical shape and defined core-shell morphology ensure a constant emission rate over at least 14 days—a crucial step toward standardizing emission testing.

In addition, certified reference gas standards (gCRM) were developed for specific pollutants. VOC encapsulation may prove to be a key technology for producing stable, reproducible reference standards. The goal was to provide realistic materials that release VOCs in a controlled manner under defined conditions—enabling reliable qualification of emission test chambers.

Accurate Predictions Enabled by Advanced Models and Materials

Another key element of the project was the development of a novel numerical model capable of simulating the release of VOCs from emission reference materials. The new materials were successfully tested in an interlaboratory comparison involving eight testing laboratories. The results demonstrated significantly improved reproducibility in emission measurements. This means that, in the future, laboratories across Europe could deliver comparable and reliable test results—a critical requirement for evaluating and monitoring building products.

International Expertise for Harmonized Standards

In addition to Fraunhofer IMM, eight other European partner institutions contributed their expertise to the project. The Federal Institute for Materials Research and Testing (BAM) coordinated the project, bringing extensive experience in testing construction products for chemical emissions and reference materials. The Dutch metrology institute VSL, with its longstanding expertise in developing and analyzing reference gas mixtures, led a key work package on gaseous calibration of analytical methods. The Turkish metrology institute TÜBİTAK UME provided expertise in surface analysis and VOC measurement technology. The Danish testing laboratory Eurofins contributed its extensive testing infrastructure for emission testing. The Politecnico di Torino (Italy) developed numerical models for mass transport processes in the ERMs, which were complemented by simulations of emission behavior by the Slovenian National Building and Civil Engineering Institute (ZAG). Belgian partner VITO contributed its expertise in producing dynamic VOC test gases and air quality analysis.

Greater Safety for Consumers and Industry

The improved testing methods offer significant benefits for both consumers and industry. Manufacturers of building products can obtain more accurate data about the emissions of their products and optimize them accordingly. Testing laboratories will benefit from standardized reference materials that enable reliable and traceable measurements. Consumers, in turn, can be confident that low-emission construction products are indeed safe for their health.

In the long term, the new testing methods will help promote the demand for and development of low-emission building materials. This not only improves indoor air quality and reduces health risks but also strengthens consumer confidence in sustainable building products. Furthermore, the project supported the advancement of European standards, creating a unified and high benchmark for emission measurements.

More information on the MetrIAQ project: https://metriaq.eu

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