

# AMBICON LAB

Faculty of Natural and Technical Sciences

Goce Delcev University

Stip, North Macedonia

# Who we are?

- AMBICON Lab is a division of the Faculty of Natural and Technical Sciences at Goce Delcev University in Stip, North Macedonia.
- Our lab has existed in various forms for more than a few decades, with a strong emphasis on the development of a methodological foundation for ambient air monitoring and environmental analyses.
- The laboratory includes 12 employees, including laboratory assistants and professors





# Who we are?

Main focus on AMBICON laboratory is control of qualitative and quantitative parameters of ambient air in real condition and real time, determining the level of personal exposure to certain hazards and an examination of morphology and chemical composition of various materials.

The current structure of AMBICON brings together two distinct scientific departments:

- **Department of ambient control and sampling**
- **Department of material analysis**



# Accreditations

- The laboratory has been accredited in accordance with ISO 17025 for the testing of environmental samples since 2014.
- 11 accredited methods
- More than 25 unaccredited methods
- Our team works daily to develop new methods.



Accredited methods	Standard
Ambient air - Standard gravimetric measurement method for the determination of the PM10 or PM2,5 mass concentration of suspended particulate matter	EN 12341:2014
Determination of metal in ambient particulate matter using Energy Dispersive XRay Fluorescence (EDXRF)	EPA/625/R-96/010a
Acoustics – Description, measurement, and assessment of environmental noise – Part 2: Determination of environmental noise levels	ISO 1996-2:2010
Acoustics – Determination of occupational noise	EN ISO 9612:2010
Determination of dust/particulate matter exposure (inhalable, thoracic and respirable) in occupational and living environment - gravimetric method	MDHS 14/3
Ambient air – Determination of numerical concentration of inorganic fibrous particles – Scanning electron microscopy method	ISO 14966:2019
Indoor air – Part 7: Sampling strategy for determination of airborne fiber concentrations	EN 16000-7:2009
Natural stone test methods – Petrographic examination	EN 12407:2019
Tests for general properties of aggregates – Part 3: Procedures and terminology for simplified petrographic description	MKS EN 932-3:2023
Determination of crystalline silica in respirable airborne dust using X-ray diffractometer	MDHS101/2:2014
Nanotechnologies – Characterization of singlewall carbon nanotubes using scanning electron microscopy and energy dispersive X-ray spectrometry analysis	ISO /TS 10798:2011

# Lab scientific focus

- Standard gravimetric measurement method for the determination of the PM<sub>10</sub>/PM<sub>2,5</sub> mass concentration of suspended particulate matter.
- Personal exposure or background workplace concentration.



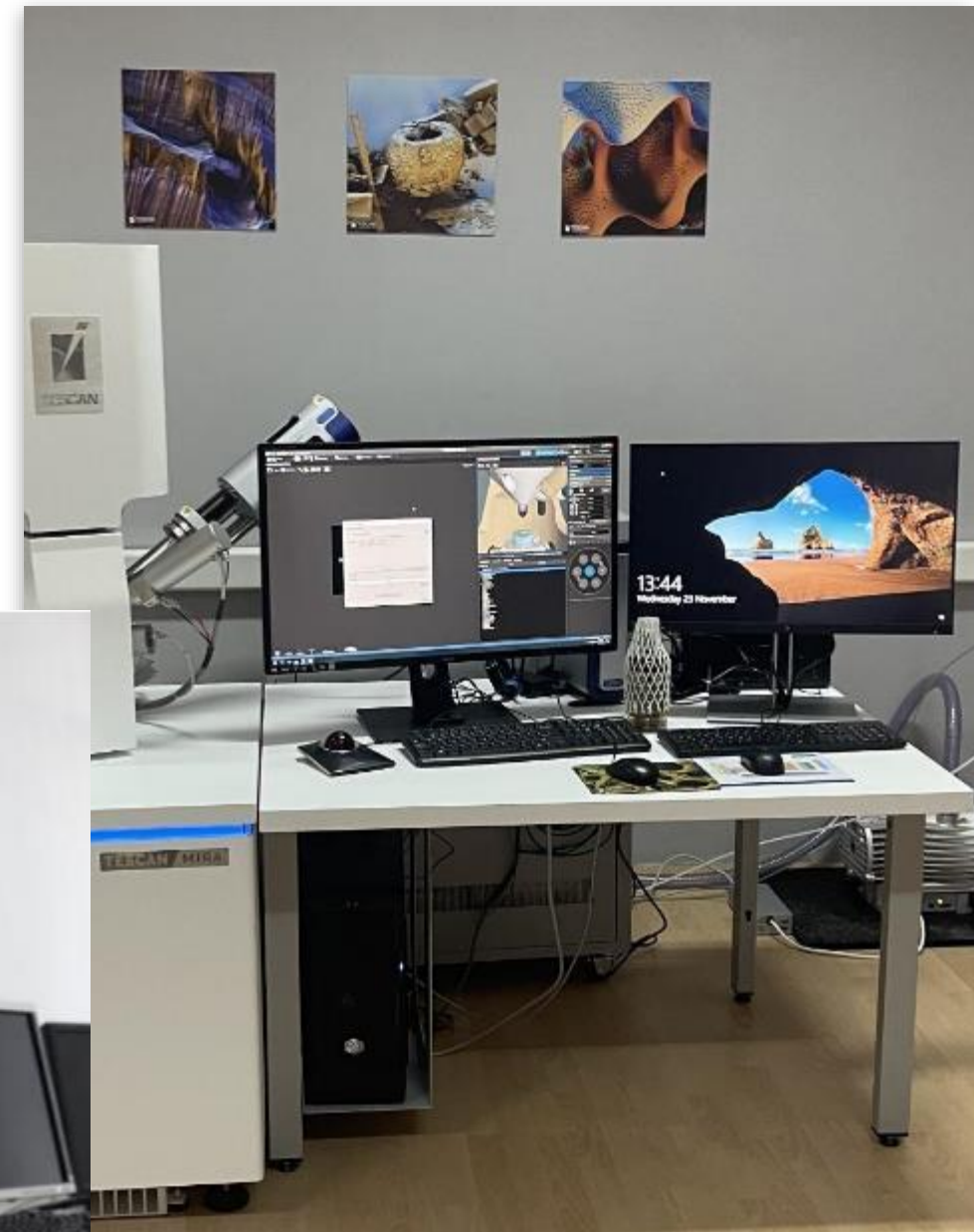
# Lab scientific focus

- Determination of chemical composition of ambient particulate matter using Energy Dispersive X-Ray Fluorescence (EDXRF), Optical Transmissometer and Spectrophotometer.



# Lab scientific focus

- Asbestos sampling and analysis.
- Particulate geometry/morphology and composition using Electron Scanning Microscopy equipped energy dispersive spectrometer (EDS).
- Direct on filter analyses of ambient air particulates mineralogy by X-ray diffractometer.





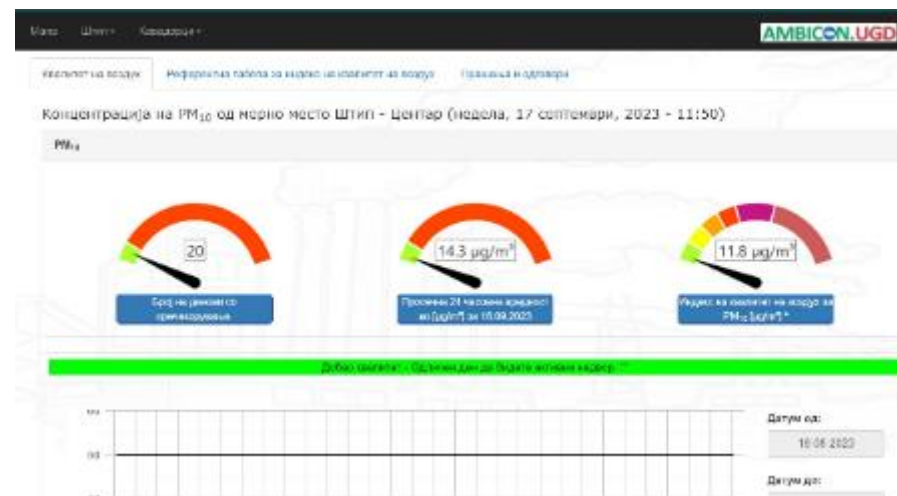
# Collaboration with industry

- As a result of permanent development and high-quality services, the lab has built a long-term collaboration with largest industrial and servicing companies based in Macedonia, Serbia, Bulgaria, Kosovo and Albania, thus building a large scientific and research database (over 1000 individual analysis per annum).



# Collaboration

- In addition, AMBICON operates independent monitoring network with in house developed ambient particulate monitors, all in close non-commercial collaboration with MOEPP and local communities to increase scientific database and support monitoring efforts in areas with no coverage or specific air quality problems. Data are in real time shared for public information using lab portal and popular air quality applications.



# Open science and multidisciplinary research

- From its inception, the laboratory has maintained a steadfast commitment to an open science approach and the pursuit of multidisciplinary research.
- Over the course of the past five years, more than 100 research personnel from various locations within the country and the area have conducted their research activities at the AMBICON Laboratory.

## A close look at air pollution's impact on the skin

The skin is exposed to numerous particulate and gaseous air pollutants. Particles that stick to the skin's surface warrant particular interest, since they can cause skin damage (possibly including atopic dermatitis, acne, premature skin ageing and skin cancers) and even enter the circulatory system. Detailed knowledge of their properties is essential to understanding the mechanisms of air pollution-induced skin damage, but data on the skin and systemic toxicity of most air pollutants are lacking.

In an analysis of a small group of healthy volunteers based in the capital of Macedonia, Mirakovski *et al.* developed a method employing a scanning electron microscopy coupled with energy-dispersive X-ray analysis (SEM-EDX) for examining particulate matter adhering to exposed skin. Their method provides evidence of the contamination of exposed skin by various airborne particulate matter of natural or anthropogenic origin (the latter caused by humans). The advantage of SEM-EDX over other analytical methods is its capacity to analyse particle composition and morphology. This study may lead to opportunities for future research.

Mirakovski D, Damevska K, Simeonovski V, *et al.* Use of SEM/EDX methods for the analysis of ambient particulate matter adhering to the skin surface. *J Eur Acad Dermatol Venereol* 2022; **36**: 1376-1381.

<https://doi.org/10.1111/jdv.18146>.



# New equipment

- AMBICON Lab is continuously acquiring new equipment:
  - Scanning Electron Microscopy MIRA LMU by Tescan
  - EDXRF NEX CG by Rigaku
  - Spectroquant® Prove 600 spectrophotometer by Merck
  - DLPI+ (Dekati® Low Pressure Impactor)

