

MARGA

Monitor for Aerosols & Gases in Ambient Air



Air pollution not only comprises gaseous components but also Particulate Matter (PM) in the form of tiny particles. These fine particles penetrate in the lungs and are detrimental for human health. Health risk of PM's is a hot issue world-wide, but it is still not known which components cause the effects. There is hence a need for more specific and long-term data!

MARGA offers a new approach in which PM, but also the acidifying gases are directly sampled in the water phase followed by on-line analysis of its ingredients, which allows fully automatic monitoring.

MARGA

Monitor for Aerosols & Gases in Ambient Air

- Reliable quantitative sampling of gases and aerosols
- Smart software with security and validation levels
- Accurate results every hour
- Modern connectivity for remote assistance and data transfer
- One week unattended operation

Concept of MARGA

MARGA measures the concentration of inorganic species in aerosols and their related gas phase components in ambient air.

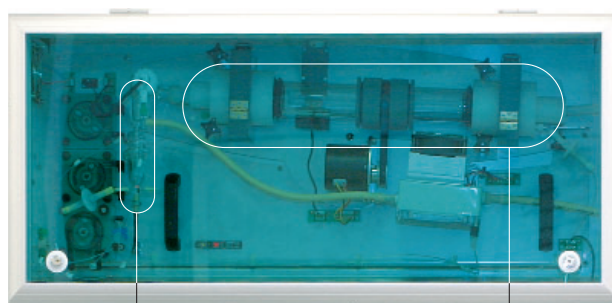
A mass flow controlled airpump draws 1 m³ ambient air per hour through the sampling box.

The size of particulate matter (PM) could be selected by placing special designed cyclones (PM 10 or PM 2.5 µm) before the entrance of the sampling box.

In this box water soluble gases are quantitatively (more than 99,7%) absorbed in a wetted rotating denuder (WRD).

Based on the difference in diffusion velocity of aerosols and gases, the aerosols will pass the WRD and are trapped in the steam-jet-aerosol-collector (SJAC) which is connected to the WRD.

By steam injection a water supersaturated condition is created, forcing a water vapor condensation process.



SJAC

steam-jet-aerosol-collector

WRD

wetted rotating denuder

By condensational growth aerosols are quantitatively (more than 99,7%) separated from the airstream in a cyclone.

The liquid streams from the WRD and SJAC are collected during exactly one hour in 25ml burettes located in the Analytical box. These samples are degassed and mixed with an internal standard and then controlled injected in anion and cation chromatographs. The ion chromatograph's sensitivity is sufficient to reach sub 0,1 µg/m³ detection limits at a 1 m³/h air sampling flow converted into a 25 ml liquid sample volume.

For lower detection limits a so-called concentrator column could be applied.

The detection system is continuously controlled by an internal calibration, performed by the addition of a standard solution containing anions and cations normally not present in ambient air.

Determination

Component	Detection Limit	Upper Limit	Inaccuracy better than	Precision better than
Gas				
HCL	0.05 µg/m ³	100 µg/m ³	6%	4%
HNO ₃	0.05 µg/m ³	100 µg/m ³	6%	4%
HNO ₂	0.08 µg/m ³	100 µg/m ³	6%	4%
SO ₂	0.1 µg/m ³	100 µg/m ³	6%	5%
NH ₃	0.08 µg/m ³	100 µg/m ³	6%	5%
Aerosol				
Cl	0.05 µg/m ³	100 µg/m ³	5%	4%
NO ₃	0.05 µg/m ³	100 µg/m ³	5%	4%
SO ₄	0.08 µg/m ³	100 µg/m ³	6%	5%
NH ₄	0.08 µg/m ³	100 µg/m ³	6%	5%
Na	0.08 µg/m ³	100 µg/m ³	7%	5%
K	0.1 µg/m ³	100 µg/m ³	7%	5%
Ca	0.08 µg/m ³	100 µg/m ³	7%	5%
Mg	0.1 µg/m ³	100 µg/m ³	7%	5%

Development

The development of the MARGA is performed by ECN (the Energy research Centre of the Netherlands) together with Applikon Analytical and Metrohm AG.

During recent years it has been used in different stages of development in American and European field campaigns for research and monitoring of ambient concentrations.



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