TECHNICAL REPORT

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English Version

Ambient air - Guide for the measurement of anions and cations in PM2,5

Air ambiant - Guide pour le mesurage des anions et des cations dans la fraction PM2,5

Außenluft - Leitfaden zur Messung von Anionen und Kationen in PM2,5

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Contents

Page

Foreword

This document (CEN/TR 16269:2011) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

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Introduction

This CEN Technical Report describes how to measure a specified range of anions and cations in $PM_{2,5}$.

The new EU Air Quality Directive 2008/50/EC on ambient air quality and cleaner air for Europe requests the measurements of concentrations of NO_3^-, SO_4^{2-}, Cl^-, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+} in $PM_{2,5}$ at rural background locations. In Annex IV of the Directive, guidance for these measurements is given (see Annex D).

Until now measurements of anions and cations in PM have been performed by the EMEP programme, mainly by using a filterpack with limited size selectivity. The Cooperative programme for monitoring and evaluation of long-range transmission of air pollutants in Europe (EMEP) was launched in 1977 as a response to the growing concern over the effects on the environment caused by acid deposition. EMEP was organized under the auspices of the United Nations Economic Commission for Europe (UNECE). Today EMEP is an integral component of the cooperation under the Convention on Long-range Transboundary Air Pollution.

Directive 2008/50/EC requires that measurements at rural sites, where appropriate, shall be coordinated with the monitoring strategy and measurement programme of EMEP. Although, there are different sampling procedures involved, a common approach is used for the analytical procedure.

In order to keep the agreement between existing EMEP data and data to be produced using this CEN technical report as close as possible, the EMEP protocol has been taken as starting point for this CEN technical report. This CEN technical report differs from the EMEP protocol in the sense that measurement of anions and cations are done in $PM_{2,5}$, and that a number of critical parameters (e.g. choice of filter materials) are fixed.

Additional attention is given to harmonizing these critical parameters with elemental carbon/organic carbon (EC/OC) measurements and with $PM_{2,5}$ measurements as well, as the sampling usually is done simultaneously.

Finally, it should be noted that this CEN Technical Report has been produced in order to give assistance to those making measurements in accordance with Directive 2008/50/EC as rapidly as possible. However, there are still some open issues, including the influence of various sampling artefacts on the data quality, which can only be answered via validation work. This CEN Technical Report is not intended to supersede existing (inter)national standards or harmonized methods.

1 Scope

This CEN Technical Report specifies a method for the determination of the mass of water soluble NO_3^-, SO_4^{2-}, Cl^-, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+} in $PM_{2,5}$ samples which can be used to comply with Directive 2008/50/EC.

This CEN Technical Report describes a measurement method which comprises sampling of anions and cations as part of the $PM_{2,5}$ particulate phase, sample extraction and analysis of anions and cations by ion chromatography. Alternately, cations, excluding ammonium can be analysed by inductively coupled plasma optical emission spectrometry (ICP-OES).

This CEN Technical Report may be used at rural background monitoring sites that are in accordance with the requirements of Directive 2008/50/EC. However, since this CEN Technical Report has not been validated in the field for these, or any other, monitoring site types, it may be considered equally applicable to all site types.

NOTE The detection limits described in this CEN technical report method will be limited by the noise level of the detector and the variability of the mass in laboratory blank filters rather than by the concentrations of anions and cations in ambient air.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
ambient air
outdoor air in the troposphere excluding workplace air

[EN 14907]

2.2
high volume sampling method
HVS
method for sampling particulate matter with a flow rate of 30 m^3/h

[EN 14907]

2.3
low volume sampling method
LVS
method for sampling particulate matter with a flow rate of 2,3 m^3/h

[EN 14907]

2.4
$PM_{2,5}$
fraction of suspended particulate matter which passes through a size-selective inlet with a 50 % cut-off efficiency at 2,5 µm aerodynamic diameter

[EN 14907]

2.5
PM_{10}
fraction of suspended particulate matter which passes through a size-selective inlet with a 50 % cut-off efficiency at 10 µm aerodynamic diameter