International Standard

ISO 23971

Surface chemical analysis — X-ray fluorescence analysis of particulate matter filters

First edition
2025-11

Reference number
ISO 23971:2025(en)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 201, *Surface Chemical Analysis*, Subcommittee SC 10, X-*ray Reflectometry (XRR) and X-ray Fluorescence (XRF) Analysis*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Air pollution originates from both natural sources (volcanoes, dust winds) and anthropogenic activities (industry, transportation, agricultural, household). It represents a major health, environmental, societal, and economic burden. Particulate matter (PM) is one of the six primary pollutants in the air and its danger varies depending on the size, concentration, and composition of the particles. Various sampling approaches and analytical requirements have been applied to the study of PMs according to the specific frameworks for and under which samples are collected, for instance for monitoring ambient air quality, workplace air, or stationary source emissions. Air filtering membrane (PM filter) remains the preferred sampling substrate. PM concentration in the volume of sampled air is determined gravimetrically by weighing filters collected from air monitoring stations, which can also perform size fraction selection. PM chemical composition, physical properties, and biological content are determined by analysing the whole or part of the PM filter.

The most widely used analytical techniques for determining the elemental composition, mainly for metals and metalloids in PM filters are atomic absorption and inductively coupled plasma-based spectroscopies (AAS and ICP). These methods are destructive as they require the complete solubilization of the solid samples in a liquid mixture. Energy dispersive X-ray fluorescence (EDXRF) is an alternative technique to the above mentioned for elemental analysis, which is non-destructive, with lower environmental impact, and which does not require sample solubilization or the use of gasses for operation. Several International Standards exist and describe methods for elemental analysis based on AAS and ICP, while only a few non International Standards describe methods based on XRF techniques.

This document is developed in response to a worldwide demand to use green and environmentally sustainable analytical methods according to the 2030 Agenda for Sustainable Development. This document supports the use of energy dispersive XRF based techniques for elemental analysis of PM filters, targeting the Sustainable Development Goals (SDGs) 11, 12, 14, 15.