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PII: S0039-9140(18)30792-6
DOI: https://doi.org/10.1016/j.talanta.2018.07.083
Reference: TAL18912

To appear in: *Talanta*

Received date: 9 May 2018
Revised date: 23 July 2018
Accepted date: 26 July 2018

Cite this article as: Roberto Cossio, Carlo Albonico, Andrea Zanella, Silvia Fraterrigo-Garofalo, Chiara Avataneo, Roberto Compagnoni and Francesco Turci, Innovative unattended SEM-EDS analysis for asbestos fiber quantification, *Talanta,* https://doi.org/10.1016/j.talanta.2018.07.083

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Innovative unattended SEM-EDS analysis for asbestos fiber quantification

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Accepted manuscript

Abstract

Scanning electron microscopy with energy dispersive spectrometry (SEM-EDS) is the only affordable analytical technique that can discriminate both morphology and elemental composition of inorganic fibers. SEM-EDS is indeed required to quantify asbestos in confounding natural matrixes (e.g. ophiolites), but is also time-consuming, operator dependent, and strongly relies on the stochastic distribution of the fibers on the filter surface. The balance between analytical time/cost and the method sensibility allows only about 0.5% of the filter to be analyzed, strongly affecting the statistical significance of results. To improve sensitivity and precision and enhance productivity, an unattended quantitative measurement of the asbestos fibers by SEM-EDS is proposed. The method identifies the particle shape first and determines their chemical composition later, saving EDS analytical time. Our approach was tested on four asbestos standards and the relative error on replicated measurements was < 10%. The proposed unattended method quantifies asbestos in natural confounding matrix, also with a very low asbestos content.

Keywords

SEM-EDS; automatic image analysis; asbestos quantitative measurement; naturally occurring asbestos; asbestos detection limit

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