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Cosmetics — Analytical approach for screening and quantification methods for heavy metals in cosmetics

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National foreword

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Foreword

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The committee responsible for this document is ISO/TC 217, *Cosmetics*.

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Introduction

Heavy metals occur naturally in the environment. Some heavy metals are utilized in many industries, and some in very small amount are essential minerals to life. On the other hand, heavy metals are often a concern due to their toxicity. Even for essential minerals, they can be a concern when excess amounts are ingested, or more generally, when the human exposure is too high, independently of the route of exposure.

Heavy metals are ubiquitous as they are found in nature (rocks, soil, water, amongst other sources). As such, these heavy metals can be found as impurities in raw materials, and, while not added intentionally to cosmetics, might be present as traces in finished products.[1][2]

The term “heavy metals” is widely used without a single definition. Commonly recognized heavy metals include, but are not limited to: lead, mercury, cadmium, arsenic, and antimony.

While it is acknowledged that heavy metal traces in cosmetic products are unavoidable due to the ubiquitous nature of these elements, companies have implemented numerous measures to monitor and control the amount that might be present.

This Technical Report presents the most common and typical analytical methods and tools for the detection of heavy metals in cosmetic raw materials and finished products.

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TECHNICAL REPORT ISO/TR 17276:2014(E)

Cosmetics — Analytical approach for screening and quantification methods for heavy metals in cosmetics

1 Scope

This Technical Report introduces most common and typical analytical approaches for screening and quantification of heavy metals of general interest at both raw material and finished product level. This Technical Report covers techniques from traditional colourimetric reaction, which can be executed without expensive instrument to the high-end one, like that of inductively coupled plasma-mass spectrometry (ICP-MS), which allows detection of elements at µg/kg level. Thus, this Technical Report covers the advantages and disadvantages of each analytical technique so that a suitable approach can be chosen.

The intent of this Technical Report is not to set or suggest acceptable concentration limits of heavy metals in both raw materials and finished products which have to be determined by each regulatory authority.

NOTE 1 The term “heavy metals” is widely used without single definition.

NOTE 2 Elements can be specified as heavy metals by one legislation, while not by others.

2 Principles

2.1 Planning

First, the approach is divided into screening and quantification of total heavy metals content. Heavy metals analysis requires not only technical knowledge and experience, but often requires expensive facilities and vigorous condition of sample preparation, especially when quantification of heavy metals content is investigated. The screening approach can contribute to identifying whether heavy metals levels should be determined using more quantitative methods.

An approach to analyse heavy metals in cosmetics products and raw materials consists of sample preparation method and detection method. Analytical testing conditions should be determined with appropriate combination of preparation method and detection method with acceptable validation data.

Sample preparation methods:

— leaching;

— digestion.

Detection tests and methods:

— colourimetric reaction;[3-8]

— x-ray fluorescence (XRF);

— atomic absorption spectrometry (AAS);

— inductively coupled plasma optical emission spectroscopy (ICP-OES), which is also known as inductively coupled plasma atomic emission spectroscopy (ICP-AES);

— inductively coupled plasma mass spectrometry (ICP-MS).

These approaches basically do not detect a difference between organic and inorganic compounds of an element. For example, they do not detect difference between metallic mercury and a phenylmercury

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