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EXTENDED ABSTRACT

Sampling and Analytical Challenges in Meeting Ever- Lower OELs for Metals and Metalloids

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Objectives

Occupational exposure limit values for metals and metalloids are decreasing, especially for metals or metalloids identified as carcinogens or sensitizers. Increasingly, size-specific sampling fractions (e.g. inhalable and/or respirable) are prescribed by regulation. These very low OELVs bring challenges to the measurement methods. and all aspects of such methods including sampling, sample preparation and instrumental analysis potentially now need to be reviewed The aim is to investigate the current status of methods and improve the science of measuring metals in workplace air.

Methods

To debate these issues, a conference on the measurement of trace metals and metalloids at workplaces, sponsored by ASTM Committee D22 on Air Quality, was recently convened in Houston, Texas USA. The event attracted 24 stakeholders from regulators, industry, academia, consultancies, trade-bodies and vendors, all with interests in improving the science of measuring metals in workplace air. Six sessions with presentations on the setting of occupational exposure limits, proficiency testing and reference materials, sampling aspects, multielement analysis and single element analysis, where discussed and debated to reach consensus on the way forward in measuring low levels of metals and metalloids.

Results

Observations showed that there is great interest from Europe because the limit values for metals and metalloids have been thoroughly overhauled in recent years. The results are often very low limit values which are also mandatory in all European Member States.
To ensure low detection limits for single and multi-element methods, increasing use is being made of ICP-MS techniques for analysing workplace assessment samples. In addition, the current used sample preparation techniques are reasonably well standardized and will need the least revision.
New developments in multi-and single element on site or near-real time monitoring, such as Spark-induced breakdown spectroscopy (SIBS) and laser-induced breakdown spectroscopy (LIBS) for multi element analysis and specific methods for hexavalent chromium or Beryllium) have been successfully validated and are available.
There are still several aspects were further research is needed. When metal speciation is needed to comply with certain occupational limit values, it is still considered very difficult and further investigation is needed. There are still challenges on the quality aspects such as setting up proficiency testing schemes for all different species of metals and metalloids that can be released in workplaces and providing the reference materials. Both are very difficult to obtain and therefor very costly. Also in the sampling part, where new developments are available for example for dealing with wall deposits, there is still a need for further investigation on their impact on the analysis and result.

Conclusions

The deliberations of the conference shows that more exchanges between industrial hygienists, analytical experts, toxicologists and epidemiologists are needed in order to clarify the way in which limit values are set and what the limits of an exposure assessment and analytical procedure are.
Projects to further investigate some gaps on sampling and quality assessment issues are necessary to make sure all aspects of measuring metals and metalloids in the workplace are covered and high quality assessments can be performed.

Keywords

Metals, metalloids, occupational exposure limit values, compliance, sampling, analytical techniques