Harmonized Protocol for the Proficiency Testing of Sampling of Environmental Matrices

If the measurement result is used to assess the properties and the characteristics of a wider batch of material, or a contaminated soil area, from which the samples analyzed are collected and prepared, the measurement process will include sampling, any sample preparation steps, and the analysis. When sampling is part of the measurement process, it should also be part of a general scheme of quality assurance (QA) within a laboratory. To this end, the external quality-control activities, commonly pursued by carrying out PTs, should be aimed also to give an external and independent assessment of the samplers' (operators') performances.

The IUPAC International Harmonized Protocol for the Proficiency Testing of Analytical Laboratories (M. Thompson et al., *Pure Appl. Chem.*, vol. 78, no. 1, pp. 145–196, 2006), updating a previous version of the protocol, is strictly focused on the analytical part of a chemical measurement process. This protocol, as well as other international references establishing guidance on this issue for wider fields of application, does not consider the sampling phase anyway.

Recent experiences on intercomparison exercise and collaborative trials on soil sampling suggest the need for a better definition of harmonized protocol for carrying out such activities. Scopes, fields of application, terminology, scheme, structure, organization, logistic aspects, and the fundamental tools for performing this kind of exercise should be discussed in the project and defined by the envisaged protocol.

Equivalence and/or analogies between reference materials (routinely distributed among the laboratories within chemical PTs schemes) and references used for sampling (soil reference sampling, reference sampling target, etc.) have even been debated in the past years. Moreover, these aspects also involve the requirements of such references to be properly used in sampling PTs.

Starting from the experience on soil sampling intercomparison exercise, the project will

1. generate general guidance for carrying out proficiency testing on sampling, and for integrating the protocols already published on proficiency testing for chemical analyses
2. include a simple example of application (where possible)

The protocol should indicate and tackle, for example, the following items:

- scope and field of application
- terminology to be used
- critical issues in the organization and design of PT on sampling
- requirements requested for the reference (assigned) values
- methods to be applied for performance assessment
- consideration of the interpretation of the results of the PT and the quality of the information obtained

The protocol will help the worldwide harmonization of comprehensive QA schemes, including proficiency testing on environmental sampling for specified matrices.

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Chlorine-Free Syntheses for Green Chemistry (PAC special topic issue)

Because of their peculiar characteristics, halogens are widely used by all sectors of the chemical industry to produce solvents, catalysts, building blocks, additives, and drugs. In addition, halogens are contained in several commodities that we all use daily (e.g., chlorine is contained in PVC, one of the most widely used plastic materials). More than 20 million tonnes of chlorine and coproducts caustic soda and hydrogen are produced each year at about 80 plants across Europe, mostly (about 95 percent) via electrolysis-based techniques (chlor-alkali industry); the sector directly employs about 40 000 people in 20 countries (data: www.eurochlor.org).

Since the Industrial Revolution, the halogen chlorine has been "an iconic molecule" for industrial chemical production. Even though its production by the electrolysis of sodium chloride is really energy intensive, it still is used, since it allows the manufacture of chlorinated derivatives in a very easy way, because of its high energy and reactivity; for example, $AlCl_3$, $SnCl_4$, $TiCl_4$, $SiCl_4$, $ZnCl_2$, PCl_3, PCl_5, $POCl_3$, $COCl_2$, etc.