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Ring test
Phenols in groundwater
P2537-RT

Summary

The entire report is available to participants only.

The ring test was designed, realised, evaluated, and authorised on behalf of PROOF-ACS GmbH by

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and

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Participants with any comments or concerns related to this ring test are invited to contact:

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DAkkS Deutsche Akkreditierungsstelle D-EP-22211-01-00

PROOF-ACS is a DAkkS accredited proficiency testing provider according to DIN EN ISO 17043:2010 (D-EP-22211-01-00). This ring test is not covered by the scope of accreditation.

PROOF-ACS GmbH does not have any analytical laboratory facilities of its own. Homogeneity testing and stability testing are subcontracted to laboratories, accredited according to DIN EN ISO 17025. The subcontracted laboratory may also participate in the ring tests. If so, the laboratory is treated in the same way as other participants and the same rules of confidentiality apply.

The proficiency test evaluates the performances of laboratories with respect to their ability to quantify seven different phenols in groundwater. The German standard method (F27) is available for the quantification. However, the labs were free to use any kind of analytical method, which they consider suitable for quantification of phenols in the announced concentration range. Limits of quantification of 0.5 µg/l or lower are considered satisfying with respect to this ring test.

The scope of the ring test is

phenol, catechol, resorcinol, hydroquinone, o-/m-/p-cresol.

Groundwater from a groundwater monitoring well is used for the preparation of the blank materials and the test materials. The groundwater was acidified with sulfuric acid during sampling (pH 1). The seven phenols as mentioned above are spiked to the test material. The spiked levels are summarised in the table below. Degradation was observed of resorcinol. The spiked level of resorcinol is provided for information only.

Eight laboratories from Germany took part in the test, reported results, and are considered for evaluation.

The performance of laboratories in the test is evaluated according to

- the *comparability* of the results. The evaluation of the comparability is based on the z-score model. The absolute value of the z-score should be at least ≤ 2. The comparability criterion is applied to phenol, and o-, m-, and p-cresol. The comparability criterion is not applicable to catechol and hydroquinone due to the limited number of reported results.
- the *trueness* of the results. The trueness is expressed as the coverage of the spiked level in %. The coverage should be at least between 70 and 120 % of the spiked level. The trueness criterion is applied to all parameters except resorcinol. Degradation was observed for resorcinol and resorcinol is thus not considered for evaluation.

Results

Parameter	Spiked level [µg/l]	Assigned value [µg/l]	Total number of results	**Comparability criterion:** no. of participants, with |z-score| ≤ 2	**Trueness criterion:** no. of participants with results within 70-120 % recovery of the spiked level
Phenol	6.2	6.21	8	8	7
Catechol	2.6	-	6	not applicable	4
Resorcinol	0.73*	-	6	not applicable	not applicable
Hydroquinone	0.68	-	6	not applicable	1
o-Cresol	3.7	3.38	8	7	6
m-Cresol	1.8	1.70	8	8	5
p-Cresol	4.3	3.87	8	8	6

* The spiked level of resorcinol is provided for information only. Degradation of resorcinol was observed.

To summarise:

- 8 laboratories reported results. The laboratories were free to choose if they report results related to all 7 phenols or a selection of it.
- All 8 laboratories reported results related to phenol and o-, m-, and p-cresol. 6 labs reported results related to resorcinol and hydroquinone.
- Degradation was observed for resorcinol. Resorcinol is thus not considered for evaluation.
- The performance of most of the laboratories is good for the quantification of phenol, and o-, m-, and p-cresol. The assigned values are in good accordance with the spiked levels (90 to 100 % recovery of the spiked level).
- The performance is dissatisfying with respect to hydroquinone. Only 1 out of 6 labs can quantify hydroquinone within the accepted range of 70 to 120 % recovery of the spiked level. Probably, the LOQs of some of the labs are too high compared to the spiked level of 0.68 µg/l.