

PRACTICE REPORT
LABORATORY ANALYSIS
PHOTOMETRY
COD CUVETTE TEST



10 × COD: a COD range for every application

COD is still the **sum parameter** that provides the most reliable information about the oxidising capability and biodegradability of **organic pollutants** in wastewater. Reservations concerning its determination were swept away long ago when operational analysis methods received **official recognition** (under the proviso that AQA measures are documented). Measuring COD by means of the LANGE cuvette test is **simple, reliable, affordable and environmentally responsible**. Ten practice related measuring ranges ensure top quality results and preliminary dilution of the sample is usually no longer necessary.



Author:
Petra Pütz
- "Diplom-Ingenieur", chemistry
- HACH LANGE applications
laboratory products

LANGE COD cuvette tests: see the advantages for yourself

Definition of COD

According to ISO 15705, COD is the volume of oxygen equivalent to the mass of potassium dichromate that reacts with the oxidisable substances in water under the working conditions of the method. Mercury sulphate, silver sulphate and sulphuric acid are specified as auxiliary reagents. The reaction time is 2 hours at 148 °C. The sample must be homogenised before the analysis is performed.

Fig. 1: Standard definition of COD



Fig. 2: Comparison of the chemicals used by the standard method and the cuvette test

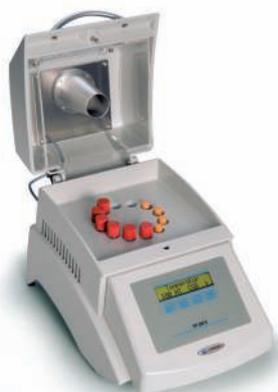


Fig. 3: Thanks to the HACH LANGE high-temperature HT 200S thermostat, COD can be determined in only 35 minutes.

Chemical oxygen demand (COD), as a sum parameter for organic pollution, is an indispensable element of wastewater analysis. It is the most frequently mentioned monitoring parameter in European legislation and serves as a design basis for the construction and efficiency of sewage treatment plants.

Its rapid availability and the narrow scatter of the measurement results make it stand out against BOD. The often discussed TOC provides clear information about the proportion of carbon in the organic pollution, but not about the amount of oxygen needed for biodegradation.

COD analysis with cuvette tests

→ Principle

The LANGE cuvette tests are based on the same reaction principle as the standard (see Fig. 1). Only the quantities of sample and reagents, and the evaluation method (photometric instead of titrimetric) are different.

The cuvette test uses over 90 % less reagents than the standard method of determination!

→ Less work, more occupational safety

The determination of COD with a cuvette test could not be easier. The measurement cuvette already contains all the necessary chemicals in exactly measured amounts, and the user simply adds a defined amount of the homogenised sample. The closed cuvette is then heated for two hours at 148 °C in a dry thermostat. Anyone who wants a faster result can use the high-temperature HT 200S thermostat (see Fig. 3), with which a

complete COD analysis can be carried out within 35 minutes. The cuvette is then evaluated with a precalibrated HACH LANGE photometer. For minimum effort and maximum quality of results, ten practice-related measurement ranges are available (see Fig. 4).

Because the reagents are supplied in exact known quantities in the cuvette and the heating is carried out in a closed system, there is a high level of safety, as any contact with the chemicals is completely reduced.

→ Quality of the results

The results of the LANGE cuvette tests are comparable with those of the standard method. This has been confirmed over a number of years in comparative studies carried out by standard laboratories and by the results of official round robin tests. Operational analysis methods are therefore not only recognised in some European countries but are used officially for routine examinations (e.g. the Netherlands).

A prerequisite for recognition of measurement results, irrespective of whether operational or standard methods are used is always the implementation and documentation of AQA measures (standard analyses, regular participation in round robin tests, etc.).

The 10 measuring ranges of the LANGE COD cuvette tests at a glance:

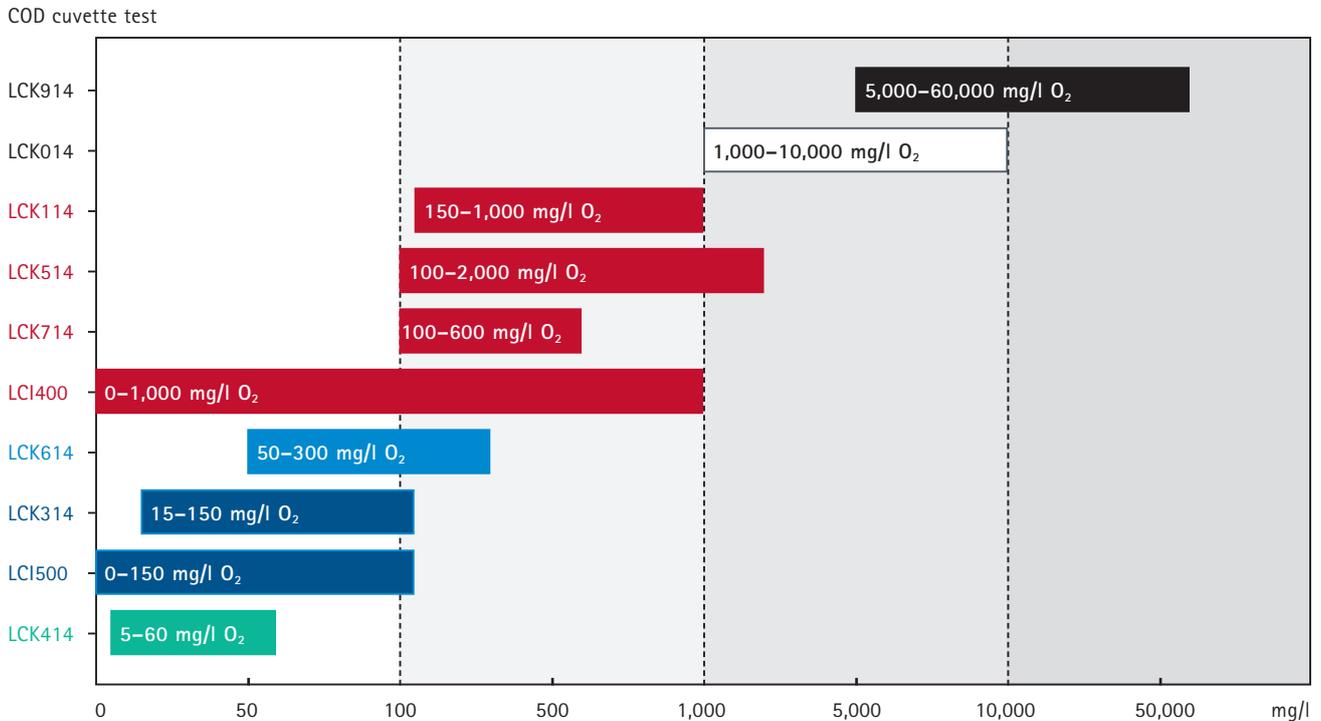


Fig. 4: The LANGE COD range with 10 practice-related measuring ranges from 5 to 60,000 mg/l O₂. In almost all cases a direct determination can be made from the homogenised original sample without time-consuming, potentially faulty or preliminary dilution.

→ Costs

Cost comparisons of operational analysis and standard analysis show that COD determinations with cuvette tests are clearly more advantageous. For example, the switch to COD cuvette tests by the Dutch environment agency some years ago resulted in cost savings of 40 %.

→ Treatment and recycling

The LANGE cuvette test is far superior to the standard method. On the one hand, far smaller amounts of environmentally harmful chemicals are used, and on the other hand, a disposal service is available for used cuvettes for proper reprocessing. The mercury containing reagents are treated in a specially developed two-stage electrolysis plant in the certified HACH LANGE Environment Centre. The reprocessing ensures that mercury and silver are recovered (see Fig. 5).



Fig. 5: Attractive waste! A silver bar made from recycled COD reagents.

Chemical oxygen demand in operational analysis

Conclusions

COD is still one of the most important parameters in wastewater analysis. For assessing wastewater and water, and the control of sewage treatment plants. The determination of COD with the LANGE cuvette test system offers numerous advantages:

- Standard-compliant method
- Reliable and comparable measurement results
- 10 practice related measuring ranges
- Less work
- Increased occupational safety
- Affordable
- Disposal/recycling service for reprocessing of the used reagents.

Literature

- ISO 15705
- HACH LANGE Practice Report on Lange Cuvette Tests 2008
- HACH LANGE Practice Report on KIWA Round Robin 2008



Laboratory Sales Manager, Matthew Dillon expressed his delight about the confidence customers have in our COD cuvettes, adding "We now supply the EA and ten of the main eleven Water Companies with COD tubes and associated instruments. The quality and reliability of our spectrophotometer, heating block and COD reagents means that customers can have confidence in the reading every time. The test is extremely simple to perform and it incorporates several unique features designed to substantially eliminate human error."

Matthew Dillon
Lab Sales Manager
HACH LANGE



Fig. 6: Robots for automated COD determination



Fig. 7: For COD and many other parameters: the complete HACH LANGE measuring system, consisting of spectrophotometer, thermostat and cuvette tests

Hazard symbols for LCK 014-914, LCI400 + 500



Toxic



Corrosive