



# COD2 Reagent Vials—Eliminate Mercury Waste

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For non-reporting purposes, mercury-free COD2 Reagent can provide you with an alternate testing option. For process control applications, COD2 Reagents will eliminate mercury waste and save on disposal costs.

The COD2 method is a micro method, just like Hach's existing COD micro method. You can use the same COD procedures and the same curves programmed into your Hach colorimeter or spectrophotometer.

COD2 Reagent is not acceptable for USEPA reporting purposes. If you need to report your COD results, use Hach's USEPA-approved COD method. See the "How to Order" section for ordering USEPA-approved COD reagent.

## Features

- Eliminates mercury waste
- Minimizes disposal costs
- Uses Hach's COD Reactor and colorimeters and spectrophotometers
- Enhances sample stream results by allowing you to run more COD tests without increasing mercury waste
- Works well in samples with known levels of chloride and ammonia

## Applications

COD2 Reagent works well for non-reporting applications where chloride and the combined chloride and ammonia interferences are acceptable. Consider using COD2 Reagent for:

- Process control in food and beverage plants, pulp and paper plants, and chemical process plants, or wherever mercury is prohibited
- Industrial waste stream monitoring
- Wastewater treatment plant influent and effluent monitoring
- Environmental monitoring

## Using COD2 Reagent Vials

Before trying COD2 Reagent, you will need to monitor the chloride and ammonia levels in your sample stream. By determining the chloride and ammonia levels, you can decide whether or not COD2 Reagent will work in your testing environment. Hach offers portable test kits, electrodes, and other instruments to help you easily measure chloride and ammonia. (See "Measuring Chloride and Ammonia.")

## Acceptable Chloride and Ammonia Levels

COD2 Reagent is available for low range, high range, and ultra high range COD measurement. COD2 Reagent does not control interference, but allows you to estimate interference. Both chloride and ammonia have the potential to interfere with the COD2 Reagent.

Chloride must be present in the sample in order for ammonia to interfere significantly. If chloride is not present in your sample, ammonia levels can exceed 50 mg/L without causing interference. The COD2 Reagent Vials will accommodate the following ranges of chloride and ammonia interferences in your sample (see Table 1).

Regular COD Reagent Vials should be used with samples containing chloride levels greater than 200 mg/L and ammonia levels greater than 50 mg/L.

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**Table 1. Acceptable Chloride and Ammonia Levels when Using COD2 Reagent Vials**

COD2 Reagent Vials	Chloride (Cl <sup>-</sup> )	Ammonia (NH <sub>3</sub> )
Low Range COD, 0–150 mg/L COD	0–100 mg/L	0–50 mg/L
High Range COD, 0–1500 mg/L COD	0–200 mg/L	0–50 mg/L
Ultra High Range COD, 0–15,000 mg/L COD	0–2000 mg/L	0–500 mg/L

## Testing Tips

The COD2 method varies slightly from the USEPA-approved COD method:

- During sample digestion in the COD Reactor, chloride is oxidized to chlorine, which causes a positive interference. The presence of chloride and ammonia causes additional interference. However, ammonia does not substantially interfere unless chloride is present.
- Chloride usually forms a silver chloride precipitate immediately after adding sample to the COD2 Reagent. This precipitate settles during the cooling step and will not interfere with colorimetric determination of COD.
- After cooling the reagent vials, do not invert the vials to mix. Mixing stirs up silver chloride precipitate, and the resulting turbidity interferes with the colorimetric determination of COD.
- After cooling, a small layer of cloudy colloidal suspension sometimes forms on the top portion of the liquid layer. If left undisturbed, this suspension will not interfere with colorimetric determinations of COD.
- Samples with high COD levels and excessive chloride and ammonia levels can be diluted to reduce the concentration of chloride and ammonia to acceptable levels (see Table 1).

## Example—Using High Range COD2 Reagent

To convert measured COD2 values to estimated COD values, compensate for any chloride and ammonia interferences in the sample. For example, a sample taken from Wastewater Treatment Plant A had the following characteristics:

- 69 mg/L chloride
- 16 mg/L ammonia
- 116 mg/L COD (using High Range COD2 Vials)

Figure 1 shows chloride concentrations in mg/L on the x-axis and ammonia concentrations on the y-axis. Using Figure 1, plot the chloride and ammonia values of the sample on the chart. Now determine where the lines intercept. This intercept point is the “interference value” (see Figure 2). The interference value is subtracted from the results obtained using COD2 Reagent Vials. This calculated value represents an estimated COD concentration.

For the sample from Wastewater Treatment Plant A, the intercept plotted on Figure 2 is 30. Use the following equation to calculate the true COD concentration for high range COD2:

$$\begin{aligned} \text{COD2 mg/L} - \text{Interference Value} &= \text{Estimated COD mg/L} \\ 116 \text{ mg/L COD2} - 30 &= 86 \text{ mg/L COD} \end{aligned}$$

In summary, you can measure COD with Hach’s COD2 Reagent. However, you must compensate for chloride and ammonia interferences in this method. After accounting for these interferences, you obtain a result comparable to Hach’s USEPA-approved COD method.

The interference compensation procedure for Low Range COD2 Reagent Vials is similar.

Figure 1 Interferences Chart for High Range COD2 Reagent Vials\* \*\*

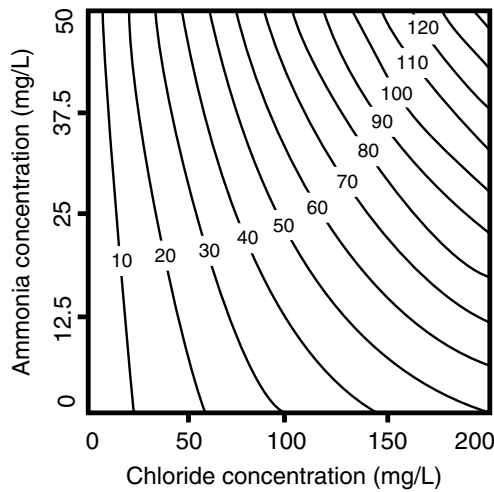
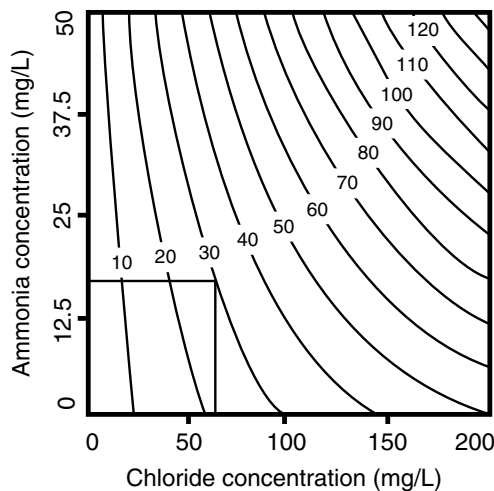


Figure 2 Ammonia and Chloride Concentrations Plotted for the Sample from Wastewater Treatment Plant A



## Measuring Chloride and Ammonia

### Test Kits

**Chloride**—To measure chloride levels in your sample stream, choose from several economical chloride test kits. The kits use the silver nitrate titration method. Kits include prepared titrant for 100 tests and instructions.

- Model 8-P Chloride Test Kit measures chloride levels between 5 to 100 mg/L and 20 to 400 mg/L using drop count titration.
- Model CDS-DT Chloride Test Kit measures chloride levels between 10–10,000 mg/L using the Digital Titrator.

Chloride QuanTab® Titrators are also available. The QuanTab titrators are available in two ranges of 30–600 and 300–6000 ppm chloride.

\* Contour lines on the interference chart represent predicted interference due to chloride and ammonia.

\*\* The Ultra High Range method uses a 0.2 mL sample. The values for ammonia and chloride may be 10 times higher in the original sample.

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**Ammonia**—To measure ammonia levels in your sample, choose from two economical ammonia nitrogen test kits:

- Ammonia Test Kit, Model NI-SA, uses the salicylate method and has a range of 0–2.5 mg/L ammonia nitrogen (NH<sub>3</sub>-N). The kit contains prepared reagents for 100 tests, a color-comparator disc, and instructions.
- Nitrogen Ammonia Test Strips have steps at 0.25, 0.50, 1.0, 3.0, and 6.0 ppm ammonia nitrogen.

Higher values can be measured by running a sample dilution.

## Ion-Selective Electrodes

For fast, easy chloride and ammonia testing, Hach offers ion-selective electrodes. The electrodes can be used with either the *sens<sup>ion</sup>*<sup>™</sup> Portable ISE Meter, or the Laboratory pH/ISE Meter. These meters provide direct readout in ion concentration.

## How to Order

### COD2 Reagent Vials—For non-reporting purposes

Description	Qty.	Cat. No.
Low Range COD2 Reagent Vials, (1–150 mg/L).....	25/pk.....	25650-25
High Range COD2 Reagent Vials, (1–1500 mg/L).....	25/pk.....	25651-25
High Range COD2 Reagent Vials, (1–1500 mg/L).....	150/pk.....	25651-15
Ultra High Range COD2 Reagent Vials, (1–15,000 mg/L).....	25/pk.....	28343-25

### COD Reagent Vials—For USEPA-approved COD Testing

High Range Plus (0–15,000 mg/L).....	25/pk.....	24159-25
High Range Plus (0–15,000 mg/L).....	150/pk.....	24159-15
High Range (0–1500 mg/L).....	25/pk.....	21259-25
High Range (0–1500 mg/L).....	150/pk.....	21259-15
Low Range (0–150 mg/L).....	25/pk.....	21258-25
Low Range (0–150 mg/L).....	150/pk.....	21258-15
Ultra Low Range (0–40 mg/L).....	25/pk.....	24158-25
Ultra Low Range (0–40 mg/L).....	150/pk.....	24158-15

### COD Reactor and Accessories

COD Reactor, 115/230 V.....	.....	45600-00
COD Reactor, 115/230 V with continental-European power cord and fuses.....	.....	45600-02
Laboratory Safety Shield.....	.....	50030-00
Thermometer, dial, 0–200 °C.....	.....	45655-00

### Test Kits

Ammonia Test Kit, Model NI-SA, 100 tests.....	.....	24287-00
Chloride Test Kit, Model 8-P, 100 tests.....	.....	1440-01
Chloride Test Kit, Model CDS-DT, 100 tests.....	.....	25806-00
High Range Chloride Test Strips.....	40/pk.....	27513-40
Low Range Chloride Test Strips.....	40/pk.....	27449-40
Nitrogen, Ammonia Test Strips.....	40/pk.....	27553-25

### ISE Meters

Portable pH/ISE Meter, <i>sens<sup>ion</sup>2</i> <sup>™</sup> .....	.....	51725-10
Laboratory pH/ISE Meter, <i>sens<sup>ion</sup>4</i> <sup>™</sup> .....	.....	51775-10

### Electrode Analysis Packages (Use with either the Portable ISE Meter or the Laboratory pH/ISE Meter)

Ammonia Analysis Package (includes Ammonia Combination Electrode, standards, and reagents).....	.....	23487-00
Chloride Analysis Package (includes Chloride Half-cell Electrode, <i>sens<sup>ion</sup></i> Reference Electrode, standards, and reagents).....	.....	23484-00



FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:  
In the U.S.A. – Call toll-free 800-227-4224  
Outside the U.S.A. – Contact the HACH office or distributor serving you.  
On the Worldwide Web – [www.hach.com](http://www.hach.com); E-mail – [techhelp@hach.com](mailto:techhelp@hach.com)

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