



## Reagents for COD analysis

The Chemical Oxygen Demand (COD) is a parameter that measures the amount of **substances** dissolved or suspended in a liquid sample **that can be oxidized** by a strong chemical oxidant.

It is used to **measure the degree of contamination** and it is expressed in milligrams per liter of oxygen (mg O<sub>2</sub>/L).

It is an applicable method in inland waters (rivers, lakes or aquifers), sewage, rainwater or water from any other source that may contain an appreciable amount of organic matter. This test is useful **for monitoring and control of wastewater treatment plants**. It does not apply, however, to drinking water, as there is a low content of oxidizable matter and the accuracy of the method would not be appropriate. In this case the method of oxidizability with potassium permanganate is used.

### Method of analysis

The most general COD determination uses **potassium dichromate** (K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>) in excess in an acidic medium with the aid of silver sulfate (Ag<sub>2</sub>SO<sub>4</sub>) as a **catalyst**, and **mercuric sulfate** (HgSO<sub>4</sub>) added to remove interference of chlorides.

Dichromate oxidizes organic and inorganic matter in the sample, and it is reduced from Cr<sup>+6</sup> to Cr<sup>+3</sup>. The test is performed at 150 °C under total reflux for 2 hours. After digestion, excess potassium dichromate is **titrated** with the Mohr salt using ferroin as indicator. The solution color changes from green to red.

### Calculation

COD as mg O<sub>2</sub>/L = (A-B) x M x 8000/ml sample

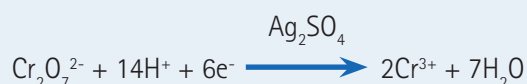
**A:** mL Mohr salt used for blank

**B:** mL Mohr salt used for sample

**M:** molarity of Mohr salt



- The main reaction involved in the determination of COD is:



- Chlorides can interfere according to the following reaction:



- To avoid the interference, HgSO<sub>4</sub> is added:



- With insufficient HgSO<sub>4</sub>:



The dichromate in excess (not reduced by organic / inorganic matter) is titrated with Mohr salt, Ammonium Iron(II) Sulfate, (NH<sub>4</sub>)<sub>2</sub>Fe(SO<sub>4</sub>)<sub>2</sub>·6H<sub>2</sub>O:





## Reagents used in COD analysis

Description	Code	Package
<b>Oxidizing Agent</b>		
Potassium Dichromate 0.04 mol/l with 80 g/l of Mercury(II) Sulfate volumetric solution	184385.1611	1000 ml
Potassium Dichromate 0.02 mol/l with 80 g/l of Mercury(II) Sulfate	177085.1612	2.5 L
Potassium Dichromate 0.005 mol/l with 20 g/l of Mercury(II) Sulfate	177074.1611	1000 ml
Mercury(II) Sulfate for analysis, ACS	132166.1208	100 g
	132166.1209	250 g
	132166.1211	1000 g
<b>Catalyst</b>		
Silver Sulfate solution 6.6 g/l in sulfuric acid	282922.1611	1000 ml
Silver Sulfate solution 10 g/l in sulfuric acid	283098.1611	1000 ml
	283098.1612	2.5 L
Silver Sulfate for analysis, ACS	131801.1606	25 g
	131801.1608	100 g
	131801.1609	250 g
Sulfuric Acid 4 mol/l (8N) volumetric solution	185314.1211	1000 ml
<b>Reducing Agent (Mohr's Salt)</b>		
Ammonium Iron(II) Sulfate 0.12 mol/l (0.12N) volumetric solution	185227.1611	1000 ml
Ammonium Iron(II) Sulfate 0.1 mol/l (0.1N) volumetric solution	181369.1611	1000 ml
	181369.1214	5 L
<b>Indicator</b>		
Ferrouin solution 0.025 mol/l (0.025M) for volumetric analysis	283462.1608	100 ml
<b>COD Standards</b>		
COD Standard (50 ppm)	394642.1606	25 ml
COD Standard (150 ppm)	394547.1606	25 ml
COD Standard (500 ppm)	394640.1606	25 ml
COD Standard (1000 ppm)	394546.1606	25 ml
COD Standard (3000 ppm)	394641.1606	25 ml
COD Standard (7000 ppm)	394545.1606	25 ml

### References:

Standard Methods 5220, Chemical Oxygen Demand (COD).  
 ASTM D1252, Chemical Oxygen Demand (Dichromate Oxygen Demand) of water.  
 ISO 6060, Determination of the Chemical Oxygen Demand (COD). Dichromate method.  
 DIN 38409, Determination of the Chemical Oxygen Demand (COD).  
 NFT 90-101, Determination of the Chemical Oxygen Demand  
 UNE 77-004

