

# COMPARATIVE STUDY OF COD PARAMETER MEASURED USING TWO DIFFERENT STANDARD METHODS

**Ana-Maria Fulgheci, Daniel Rudaru, Alexandra Stavarache, Irina Eugenia Lucaciu**

National Research and Development Institute for Industrial Ecology – ECOIND, 57-73 Drumul Podu Dambovitei, district 6, 060652, Bucharest, [ana.fulgheci@ecoind.ro](mailto:ana.fulgheci@ecoind.ro), Romania

## Introduction

The pollution level of organic matter in water bodies is roughly predicted by analysing chemical oxygen demand (COD). Monitoring COD helps ensure compliance with the regulations, which are designed to protect water quality and prevent excessive pollution. If the high COD wastewater is directly discharged into the environment, it will threaten aquatic organisms, directly or indirectly affecting human life and health. Therefore, the detection of COD in water has great significance in the prevention and control of environmental and ecological pollution.

This study mainly focuses on the determination of COD parameter measured from different samples of waste waters and surface waters using two Romanian standard methods.

## Materials and methods

Different types of water were collected, as follows:

- i) 4 samples of influent and, respectively, effluent of municipal wastewater treatment plants located in Bucharest;
- ii) 6 surface waters from several lakes located along the Colentina river.

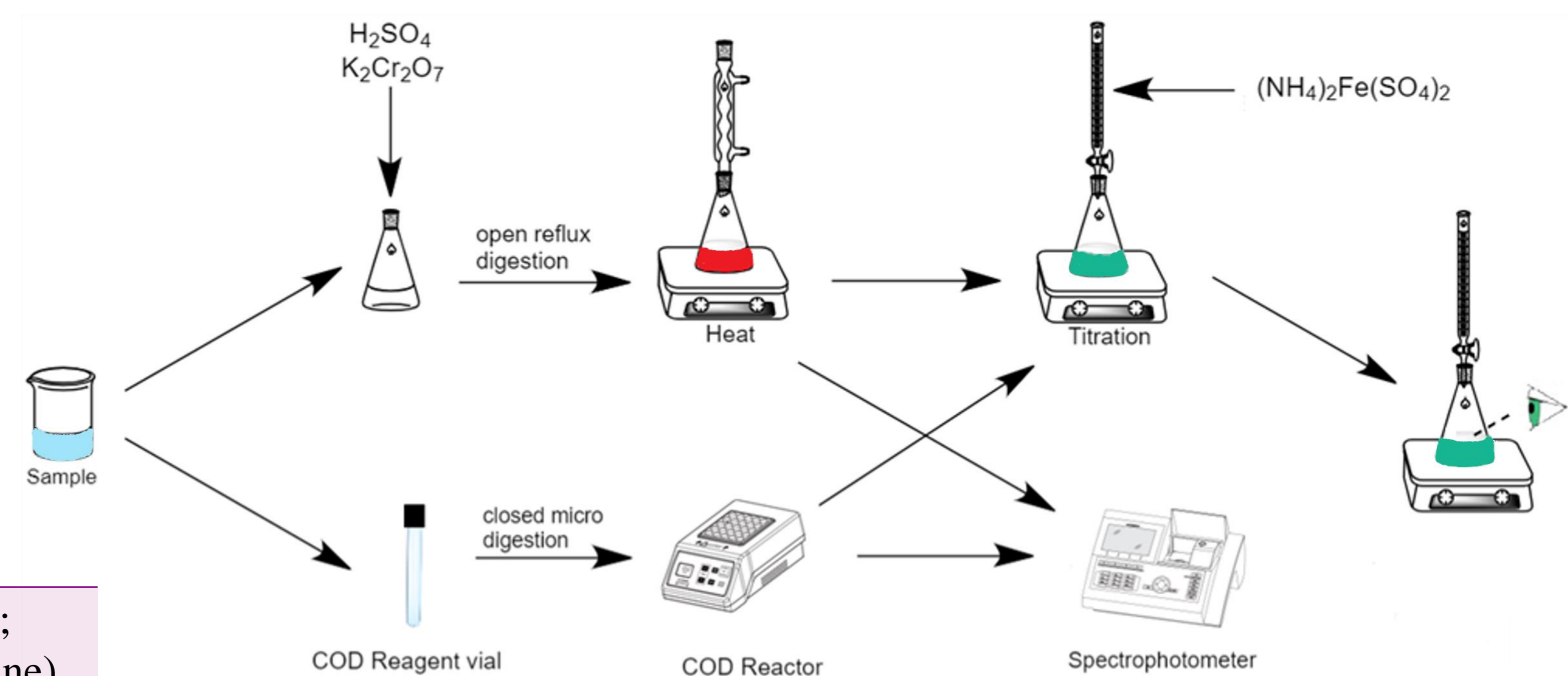


Figure 1. Macro-digestion method vs. Micro-digestion method

Step of the method	Conventional COD	ST-COD
<b>Digestion</b>	Same reagents: sulphuric acid; silver sulphate (oxidation catalyst); potassium dichromate; mercury(II) sulphate (elimination of chlorine)	
	Sampling amount: 10 mL	Sampling amount: 2 mL
	Digestion: open reflux – 2 h at 150°C	Digestion: closed reflux procedure – 2 h at 150°C
<b>Detection</b>	<i>Titrimetric</i> , using ferroin as an indicator	<i>Photometric</i> : measuring the absorbance of the formed Cr <sup>3+</sup> at an appropriate wavelength

Table 1. Comparison of the methods used to measure COD

## Results and Conclusions

- The difference between COD and ST-COD is negative for matrix – waste water with values > 100 mg O<sub>2</sub>/L; the relative deviation of the mean of the consensus values for COD and ST-COD varies between -2% and -3.8%.
- In waters with concentration level of COD content < 100 mg O<sub>2</sub>/L (effluent of WWTP and surface water), the values obtained for ST-COD are lower than the ones obtained for COD measures with classical method and the relative deviation varies between 5.7 and 15.3.
- ST-COD method presents results that are systematically lower than COD conventional method for waters with COD content < 100 mg/L.

Sample Type	COD <sub>Cr</sub> values (mg O <sub>2</sub> /L)		Deviation (mg O <sub>2</sub> /L)	Relative Deviation (%)
	Conventional COD method	ST-COD method		
<b>Waste Water</b>				
Influent WWTP-Glina	456	469.8	-13.8	-2.98
	468	486	-18	-3.77
	470	481	-11	-2.31
	452	461	-9	-1.97
Effluent WWTP-Glina	79.6	74	5.6	7.29
	75	70	5.0	6.90
	72	68	4.0	5.71
	74.8	69	5.8	8.07
<b>Surface Water (Colentina River)</b>				
Lake 1	38.5	33.4	5.1	14.2
Lake 2	36.2	31.8	4.4	12.9
Lake 3	35.6	32	3.6	10.65
Lake 4	35.2	31	4.2	12.7
Lake 5	36.8	32.2	4.6	13.33
Lake 6	38	32.6	5.4	15.3

Table 2. Comparison between COD and ST-COD results obtained in wastewater and surface water

Method in closed tubes is often used in specialized laboratories, having the undeniable advantage of reducing the use of toxic substances (hexavalent chromium and mercury salts).

## Acknowledgment

This work was carried out through the “Nucleu” Program within the National Research Development and Innovation Plan 2022-2027 with the support of Romanian Ministry of Research, Innovation and Digitalization, contract no. 3N/2022, Project code PN 23 22 02 01.



Figure 2. Determination of COD using Micro-digestion method