Parameter Fact Sheet – Chemical Oxygen Demand (COD)

In environmental chemistry, the Chemical Oxygen Demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers) or wastewater, making COD a useful measure of water quality. It is expressed in milligrams per litre (mg/L) also referred to as ppm (parts per million), which indicates the mass of oxygen consumed per litre of solution.

For many years, the strong oxidizing agent potassium permanganate (KMnO₄) was used for measuring chemical oxygen demand. Measurements were called oxygen consumed from permanganate, rather than the oxygen demand of organic substances. Potassium permanganate’s effectiveness at oxidizing organic compounds varied widely, and in many cases biochemical oxygen demand (BOD) measurements were often much greater than results from COD measurements. This indicated that potassium permanganate was not able to effectively oxidize all organic compounds in water, rendering it a relatively poor oxidizing agent for determining COD.

Since then, other oxidizing agents such as ceric sulphate, potassium iodate, and potassium dichromate have been used to determine COD. Of these, potassium dichromate (K₂Cr₂O₇) has been shown to be the most effective: it is relatively cheap, easy to purify, and is able to nearly completely oxidize almost all organic compounds.

In these methods, a fixed volume with a known excess amount of the oxidant is added to a sample of the solution being analysed. After a refluxing digestion step, the initial concentration of organic substances in the sample is calculated from a titrimetric or spectrophotometric determination of the oxidant still remaining in the sample. As with all colorimetric methods blanks are used to control for contamination by outside material.