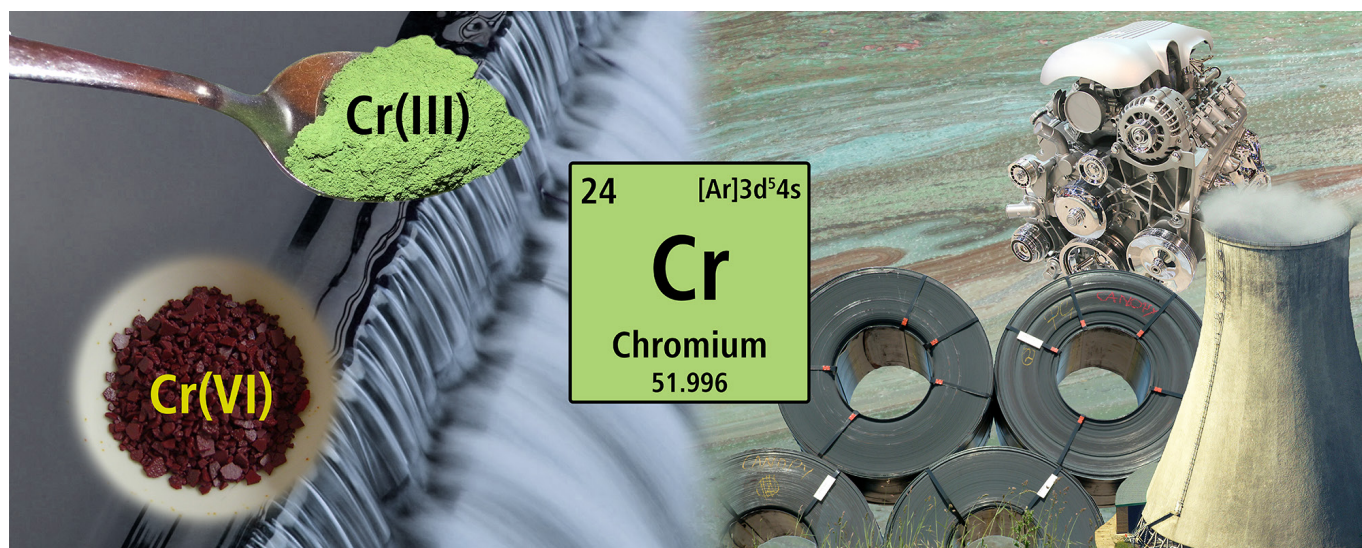


Detecting Chromate (Cr(VI)) in Waste Water Streams

Chromium is useful in many industries – in the production of pigments and dyes for textiles, paints, and colored glass, anodized or plated onto metals for surface finishing applications, as an oxidizing agent to tan and process leather, and as a corrosion inhibitor in industrial cooling towers. Chromium is a necessary component in the manufacturing of stainless steel (minimum [Cr] of 10.5%), of which China is the leading producer (2016). Chromium is produced from chromite ores (MCr_2O_4 , **M** = metal) which are mainly sourced by mines in South Africa, supplemented by India, Turkey, and Kazakhstan. The two most common oxidation states are Cr(III) and Cr(VI). Cr(III) is a crucial trace element, found in whole grains, spices/herbs, legumes (pulses), and meats. In contrast, Cr(VI), also known as hexavalent chromium, is extremely toxic, and can lead to organ failure and death depending on intensity and duration of exposure.

The World Health Organization guidelines for hexavalent chromium in drinking water have been set at 50 µg/L, though even this value has been questioned as being too high. Cr(VI) is more soluble and thus more mobile than Cr(III). This means hexavalent chromium easily leaches from soil to ground and surface waters, and can enter the air through evaporation and combustion processes. Monitoring waste streams containing chromium is extremely important because of the low concentrations of Cr(VI) required to cause bodily harm and its high solubility and affinity for leaching. Metrohm Applikon offers multiple Process Analyzers configured for photometric measurements which provide accurate, reproducible Cr(VI) results that you can rely on, while protecting personnel from manually sampling this harmful substance.



Some different chromium oxide compounds (CrO_3 and Cr_2O_3) and various products and industries which use chromium.

Application: This is a colorimetric method suitable for the determination of Cr(VI) in water. Chromium(VI) is mixed with reagents, resulting in a soluble product which can be measured photometrically at a wavelength of 560 nm.

Typical Range: 0–100 µg/L Cr(VI), but measurable up to 1 mg/L (undiluted). With dilution: up to 100 mg/L.

Remarks: Other applications are available for industrial wastewater such as: ammonia, phosphate (ortho and total), total iron [$\text{Fe}^{2+}/\text{Fe}^{3+}$], nickel, nitrogen compounds, copper [$\text{Cu}^+/\text{Cu}^{2+}$], alkalinity, chemical oxygen demand (COD) and many more.