Dovendo organizzare e gestire lo svolgimento dell'esperienza di laboratorio denominata "Determinazione **dei solfati per via gravimetrica"** per 25 studenti iscritti al 1° anno della Laurea in Chimica Verde e Sostenibile in un laboratorio dotato di 20 postazioni individuali a banco e di 8 postazioni individuali sotto cappa, illustrare almeno 3 degli aspetti riportati al punto 1 e svolgere il calcolo stechiometrico riportato al punto 2:

1.
   - Discutere il principio del metodo e il campo di applicazione
   - Individuare la strumentazione, i reattivi e gli accessori necessari.
   - Spiegare come si procede per la predisposizione della strumentazione, dei reattivi e degli accessori necessari per l'esecuzione della prova.
   - Discutere eventuali interferenze e cause di errore.
   - Spiegare come si raccolgono le informazioni di sicurezza necessarie per lo svolgimento dell'esperienza e come si procede per etichettare i contenitori dei reattivi inziali e dei prodotti finali.

2. Calcolo stechiometrico
   Calcolare il volume di una soluzione di $BaCl_2$ (MM = 208.25 g/mol) al 25 % m/m (densità = 1.05 g/mL) necessario per ottenere la precipitazione quantitativa degli ioni SO_4^{2-} presenti in 500 mL di una soluzione acquosa in cui sono stati solubilizzati 10 g di Na_2SO_4 (MM = 142.04 g/mol) puro al 95%.

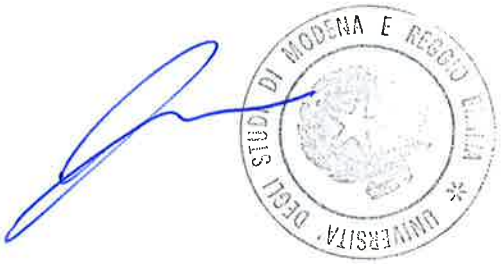
Atomic Absorption Spectroscopy in Analytical Chemistry

Atomic absorption spectroscopy (AAS) is an analytical technique used to measure the concentration of specific elements in a sample. It is widely applied in fields such as environmental analysis, food safety, pharmaceuticals, and metallurgy due to its accuracy and sensitivity.

The basic principle of AAS involves the absorption of light by free atoms in the gas phase. A sample is first vaporized in a flame or graphite furnace, breaking it down into individual atoms. A light source, typically a hollow cathode lamp, emits radiation at wavelengths specific to the element being analyzed. As the light passes through the vaporized sample, the atoms of the target element absorb the light at their characteristic wavelength.

The amount of absorbed light is proportional to the concentration of the element in the sample. A detector measures the reduction in light intensity, and the results are displayed as an absorption value. Using calibration curves, the concentration of the element can be quantified accurately.

AAS is highly sensitive, capable of detecting trace amounts of elements, often in parts per million (ppm) or even lower. It is particularly useful for analyzing metals such as lead, cadmium, and mercury. Its precision and reliability make atomic absorption a cornerstone of modern analytical chemistry.



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Dovendo organizzare e gestire lo svolgimento dell'esperienza di laboratorio denominata **"Determinazione della durezza totale di un campione di acqua minerale mediante titolazione complessometrica"** per 18 studenti iscritti al 2° anno della Laurea in Chimica Verde e Sostenibile in un laboratorio dotato di 20 postazioni individuali a banco e di 8 postazioni individuali sotto cappa, illustrare almeno 3 degli aspetti riportati al punto 1 e svolgere il calcolo stechiometrico riportato al punto 2.

La determinazione della durezza totale dell'acqua si basa sulla formazione del complesso tra gli ioni Mg^{2+} e Ca^{2+} con la forma anionica dell'acido etilendiamminotetraacetico (EDTA) in ambiente basico.

1.
   - Discutere il principio del metodo e il campo di applicazione
   - Spiegare come si procede per la predisposizione delle apparecchiature e la preparazione dei reattivi per l'esecuzione della prova.
   - Spiegare come si procede per la verifica della concentrazione della soluzione titolante di EDTA in assenza di soluzioni commerciali a titolo noto.
   - Discutere eventuali interferenze e cause di errore.
   - Spiegare come si raccolgono le informazioni di sicurezza necessarie per lo svolgimento dell'esperienza e come si procede per etichettare i contenitori dei reattivi inziali e dei prodotti finali.

2. Calcolo stechiometrico
   Esprimere la durezza in gradi francesi di una acqua sapendo che per titolare 100 mL di tale acqua sono necessari 15 mL di una soluzione acquosa di EDTA 0.01 M. Un grado francese corrisponde a 0.01 g/L di $CaCO_3$.

Ultraviolet–visible spectroscopy

Ultraviolet–visible spectrophotometry (UV–Vis or UV-VIS) refers to absorption spectroscopy or reflectance spectroscopy in part of the ultraviolet and the full, adjacent visible regions of the electromagnetic spectrum. Being relatively inexpensive and easily implemented, this methodology is widely used in diverse applied and fundamental applications. The only requirement is that the sample absorb in the UV-Vis region, i.e. be a chromophore. Absorption spectroscopy is complementary to fluorescence spectroscopy. Parameters of interest, besides the wavelength of measurement, are absorbance (A) or transmittance (%T) or reflectance (%R), and its change with time.

A UV-Vis spectrophotometer is an analytical instrument that measures the amount of ultraviolet (UV) and visible light that is absorbed by a sample. It is a widely used technique in chemistry, biochemistry, and other fields, to identify and quantify compounds in a variety of samples.

UV-Vis spectrophotometers work by passing a beam of light through the sample and measuring the amount of light that is absorbed at each wavelength. The amount of light absorbed is proportional to the concentration of the absorbing compound in the sample.

Most molecules and ions absorb energy in the ultraviolet or visible range, i.e., they are chromophores. The absorbed photon excites an electron in the chromophore to higher energy molecular orbitals, giving rise to an excited state. For organic chromophores, four possible types of transitions are assumed: π–π^*, n–π^*, σ–σ^*, and n–σ^*. Transition metal complexes are often colored (i.e., absorb visible light) owing to the presence of multiple electronic states associated with incompletely filled d orbitals.

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