DETERMINATION OF THE AMOUNT OF IRON IONS USING ORGANIC REAGENTS

Abdullayeva Rayhon Aminovna
(2nd year graduate student of Urganch Davlar University),
Ataullayev Zokir Makhsudovich
Urganch State University, teacher of the Department of Chemistry
a_zokir16@mail.ru
https://doi.org/10.5281/zenodo.7565394

Currently, in colorimetric analysis, the concentration of Mn ion is determined using its characteristic color. However, few metal ions produce such strong colors, especially at low concentrations. Many colored complexes can be formed from metal ions and organic or inorganic complexing agents. These complexes are the result of interaction between Lewis acid (metal ion) and Lewis base (complex former) [1]. An ideal color-forming reagent requires that it be stable and selective (even specific) and that it reacts rapidly to form soluble, highly colored complexes.

Organic colorimetric reagents are more sensitive than inorganic ones. They produce more intense colors and are therefore often used for trace analysis. Concentrations can be determined with many organic reagents. For example, with 2,2'-bipyridyl, it forms a bright red complex with iron (II), which can be used to determine iron concentration.

The complex forms an octahedral geometry, coordinate covalent bonds are formed between neighboring sp^3d^2 hybrid orbitals of Fe^{2+}.

If iron(III) ions are present in the solution, they must be reduced to the iron(II) state to form a colored solution.

During the preparation of the standard solution, the absorbance indicators of the sample and the standard solution are compared. This method reduces the influence of instrument and solution changes [2].

A detectable standard of ferrous ammonium sulfate is not usually considered a primary standard, but it is available at a purity greater than 99% and is therefore appropriate for use.

To prepare the Fe solution, measure $Fe(NH_4)_2(SO_4)_2 * 6H_2O$, 392.14 grams of iron ammonium sulfate with an accuracy of ± 0.1 mg, and prepare a 250 ml solution with a concentration of 0.00200 M relative to this compound. . The amount of salt is prepared in a 250 ml volumetric flask, add enough water to dissolve the salt, add 8 ml of 3 M H_2SO_4, dilute to the mark with distilled water and mix well. Transfer 10 mL of this solution to a 100 mL volumetric flask, add 4 mL of 3 M H_2SO_4, dilute to the mark with distilled water, and mix thoroughly.

In order to determine the wavelength when measuring the absorption spectrum, it is necessary to obtain the absorption spectrum of the iron-bipyridyl complex. Readings taken at 10 nm intervals are sufficient to determine the absorbance spectrum, except possibly for absorbance peaks where additional points may be required to characterize the curve more fully. Pour 10 ml of Fe solution into a 50 ml volumetric flask. Add about 10 drops of 3 M H_2SO_4 to a second 50 mL volumetric flask, without adding any of the iron solution. 1 ml of 10% hydroxylamine hydrochloride solution, 10 ml of 0.1% bipyridyl solution and 4 ml of 10% sodium acetate solution are added to each flask in the indicated order. It is necessary to mix thoroughly after adding each reagent.

In the determination of iron (II) ions using organic reagents, the following is concluded:

1. The amount of unknown Fe is determined in a short period of time
2. The wavelength of maximum absorption of the solution is found
3. The average absorbance of the standard Fe solution is calculated
4. The concentration of the standard Fe solution is determined in a short time

References:

1. Грабельных В.А. Новый тип сорбентов на основе полисульфида натрия из
отходов производства эпихлоргидрина для извлечения соединений тяжелых
металлов / В.А. Грабельных, Е.П. Леванова, А.В. Рединова, Н.В. Руссавская, О.Н. Игнатова, Н.А. Корчевин // Химия в интересах устойчивого развития. – 2012. – Т. 20. – № 2. – С. 199 – 202.

2. Рединова А.В. Утилизация отработанных серосодержащих сорбентов, получаемых из полисульфида натрия и хлорорганических отходов/ В.А. Грабельных, Е.П. Леванова, Рединова А.В., Н.В. Руссавская, Н.А. Корчевин // Химия в интересах устойчивого развития. – 2012. – Т. 20. – № 6. – С. 687 – 691.