Fully discuss absortion and emission spectroscopy follows instruction below

Science, Chemistry

Atomic emission spectroscopy Atomic emission spectroscopy and atomic absorption spectroscopy are analytical techniques used to determine presence and concentration of certain elements in a laboratory samples. Atomic emission spectroscopy utilizes an instrument called atomic emission spectrometer or flame photometer. Basically, the flame is used to atomize the sample so that radiation emitted is measured. Understanding the principle of atomic emission spectroscopy would require a brief description of the instrument used. This would offer us an insight on the principles involved in this form of spectroscopy. The atomic emission spectrometer consists of four major components. These include the atomizer, the nebulizer, the Monchromator and the detector. Flame is used to atomize the sample so that the resultant atoms can interact with the radiation. Monchromator is used to discriminate wavelengths that do not conform to the requirements of the experiment. Detector is used to detect the emitted wavelengths. During experiment, five processes take place. The first three processes takes place simultaneously. These threes processes include the dissolvation, vaporization and atomization. They take place when the sample is introduced into the atomizer. Dissolvation is the process where the solvent sued to dissolve the sample is evaporated (Crouch & Skoog 63).

The thermal heat energy from the atomizer forces the solvent, which is water, to evaporate instantly. Vaporization occurs when the resultant solid sample is vaporized into gases. Lastly, the atomization occurs when the resultant gases are broken down into atoms. All these takes place as a result of high thermal energy from the flame. Principally, both the atomic emission spectroscopy and the atomic absorption spectroscopy exhibit all these three steps. However, the fourth step is what differentiates the atomic emission spectroscopy from the atomic absorption spectroscopy. I atomic emission spectroscopy, the gaseous products obtained are excited to higher energy level. Excitation occurs when the electrons in the atoms gain energy and move to higher energy levels. However, the electrons cannot stay in the higher energy level indefinitely (Crouch & Skoog 71).

This is because there is no constant energy to maintain them in the higher energy levels. Because of this, they are unstable. Consequently, to regain their stability, electrons would be forced to drop back to their original state called ground state. This process is called de-excitation. De-excitation is normally accompanied by several transitions. Some electrons would fall back through smaller steps whereas others would undergo single transition. This is why when the chart is produces, it has several lines. Transition is accompanied by emission of radiation corresponding to the energy gap. Emission of radiation of various wavelength occurs which is characteristics of the element of interest. It should be noted however that the stronger wavelengths called the resonance is used for analytical purposes. Because of this, there is need to filter other emissions that does not respond to resonance. Monchromator does this role (Crouch & Skoog 73).

The standard graph showing concentration against percentage intensity is then determined. The quantitative analysis can then be carried out by comparing it with the standards.

Atomic absorption spectroscopy

Atomic absorption spectroscopy is another alternative used to find out the presence and quantities of given metals. As mentioned earlier, the first three steps of AAS resembles the first three steps of AES. However, the difference occurs in the fourth step. This difference is due to the fact that the AAS has external source of light apart from the atomizer. This source is called hollow cathode lamp. The lamp produces light of narrow wavelength. Inside the lining of the cathode lamp is made up of metal of interest. Because of this, the lamp would produce specific wavelength of the element being determined (Crouch & Skoog 81).

This means that if the analyst want to determine the presence and amount of sodium in a sample, then he or she should use the cathode lamp coated with sodium. The light from the lamp is directed to the region of flame with high optimal signal. If the sodium is in flame, then the sodium would absorb the light from the lamp. This is the reason why this technique is relatively specific and sensitive. Some of the light would be absorbed whereas others would pass through the sample. The detector is able to relate the intensity of incidence light to the intensity of transmitted light. After getting the absorbance, the standards of various concentrations are prepared. The absorbance of the standards is also determined. This is followed by plotting the graph of absorbance verses the concentration of the standards. From the graph, the concentrations of the sample can be determined. It should be noted however that AAS cannot analyze sulfur directly. Because of this cospeciation of charges covalent bonds of sulfur, sulfide and H3SO4 is normally done so that the compounds such as sulfur can be determined (Crouch & Skoog 83).

Works cited

Crouch, Stanley & Skoog, Douglas. Principles of instrumental analysis.

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