Fluorescence spectrophotometry reports examples

Environment, Water

Introduction

Aspirin or acetylsalicylic acid refers to a salicylate drug that is usually used to relieve pains as an analgesic, as an antipyretic in the reduction of fever, as well as in fighting against inflammation. Aspirin falls in the category of weak acids and usually undergoes slow hydrolysis where one molecule of aspirin reacts with two hydroxide (OH-) ion. Different methods are applied in determining the amount of aspirin that is contained in an analgesic drug. These methods include back titration and fluorescence spectrophotometry. In fluorescence spectrophotometry, the molecules absorb the light energy supplied and then re-emit it. The emitted light is referred to as fluorescent emission, and its strength is proportional to the quantity of the fluorescent compound that is in the cuvette. Measuring the fluorescent emission may thus enable determination of the content of a compound in a sample. This experiment aimed to demonstrate the principles of fluorescence spectrophotometry through the determination of aspirin content of analgesic tablets.

Methods

Extraction of Aspirin

An analgesic tablet was accurately weighed and thoroughly crushed using a mortar and pestle. About 0. 1 g of the crushed tablet was dissolved in 20ml of chloroform in a tightly glass stoppered 50 ml flask. Aspirin was extracted with two 10 ml aliquots of 1% Na_2CO_3 and one 5 ml aliquot of deionized water. The aspirin-containing extract was transferred into a 50 ml volumetric flask, and 20 ml of 0. 5 M NaOH was added. The amount was diluted to the

mark using deionized water and the content mixed. Both 1: 100 and 1: 1000 dilutions of the above solution were prepared with 1% sodium carbonate.

Preparation of standard solutions

In order to facilitate the preparation of working standards of 1. 0, 2. 0, 4. 0, 6. 0, 8. 0 and 10 ppm, a stock standard solution of salicylic acid was prepared. Deionized water was used to dissolve the salicylic acid and diluted with 1% Na2CO3. A pH meter was employed to set the pH of all the working standards to pH 11. 00 using 0. 5 M KOH.

Instrumental Procedure

FL Winlab was opened and the 341-Salicylic method selected. Using the ‘ Pre-scan’ option, all wavelengths between 275 and 375 were scanned for excitation and 350-450 for emission. The optimum wavelength for excitation and emission were selected using this scan. The emission of all the standard solutions was determined using the parameters determined by the pre-scan and starting with the lowest concentration unknown, the concentration that was bracketed by the emission of the standards was determined. The concentration of the unknown was determined.

Results/ Discussion

The results for the emission of the standard samples were recorded in Table 1 below.

The result for the emission of the test sample was recorded in Table 2 below.

Using the emission and concentration for the standard samples a graph of emission against concentration in ppm was plotted as shown in Figure 1 below.

The equation of the line obtained was used to determine the concentration of the unknown sample as follows.

y = 93. 597x + 7. 1898

273. 3 = 93. 597x + 7. 1898

273. 3-7. 1898= 93. 597x

266. 1102= 93. 597x

x= 2. 84 ppm

Factoring in the dilution factor of 1: 1000, the concentration of acetyl salicylate was 2840 ppm. The standard curve was, however, for a compound with a molecular mass of 138. 121 g/mol while the compound of interest has a molecular mass of 180. 157 g/mol. Factoring this difference, 2840 ppm can be converted as follows

138. 121 g/mol = 2840 ppm

180. 157 g/mol= 2840×180. 157138. 121

= 3704. 331 ppm

Conclusion

The experiment aimed to demonstrate the principles of fluorescence spectrophotometry through the determination of aspirin content of analgesic tablets. From the experiment, the amount of aspirin in an analgesic tablet was successfully determined to be 3704. 331 ppm. In fluorescence

spectrophotometry, it is not possible to use a cuvette that has two of its opposite sides frosted. This is because the detector that is used in the technique detects the emitted light at a right angle to the excitation beam. This means the emitted light will have to pass through one of the frosted sides if such a cuvette is used affecting the intensity of the light emitted. A special quartz cuvette is needed in this experiment since it has no side that is frosted and can transmit both visible light and UV lights. The cuvette is also able to withstand higher temperatures than the normal cuvette.

The procedure used obeyed the Beer’s Law since there was a linear relationship existing between emission and the concentration of the sample. Some sources of error may have resulted from inaccuracy in measuring samples and thus leading to differences in the values obtained.

In conclusion, the success in determining the content of aspirin in a tablet is an indication that fluorescence spectrophotometry is a very analytical useful.