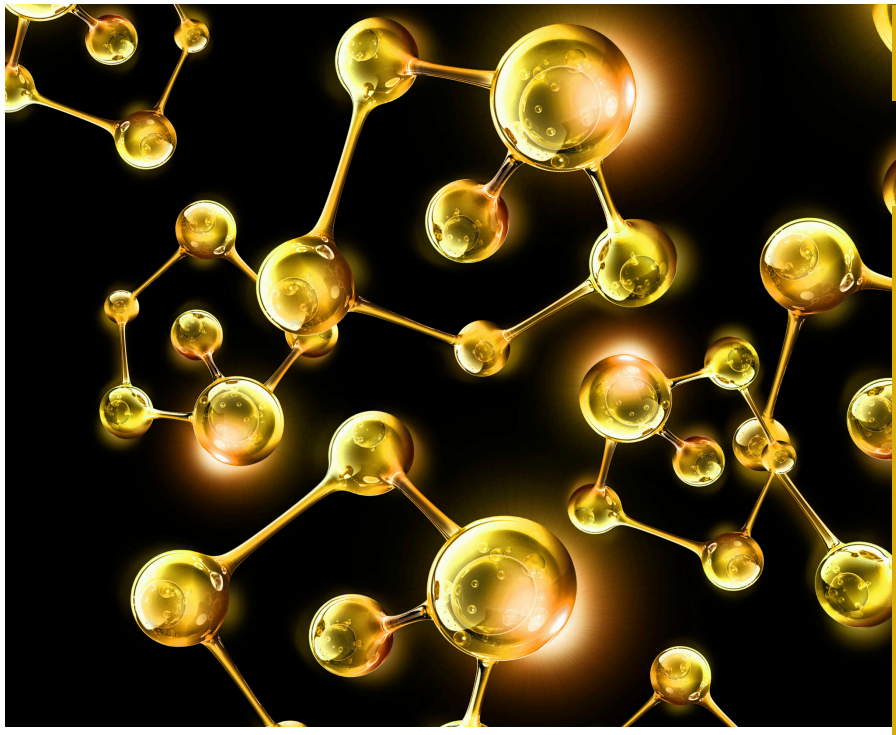

APPLICATION BRIEF

UV/Visible Spectroscopy

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Measurement of Gold Nanoparticle Solutions on the LAMBDA 265 Personal Array UV/Visible Spectrophotometer

Introduction

Gold nanoparticles are of interest in the study of modern materials. They have unique optical, electronic, and thermal properties and are used in a wide range of applications including diagnostics assays, microscopy and electronics. Although of interest in the quest to find novel materials, they have been used since ancient times as a pigment for stained glass. Gold nanoparticle solutions exhibit different optical properties compared with gold in its more familiar "macro" form as they have a reddish colour which changes as the particle size increases. These optical properties can be measured using the LAMBDA™ 265 Personal Array UV/Visible Spectrophotometer.

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Gold nanoparticle solutions were obtained from BBI Solutions in four nanoparticle sizes – 10 nm, 20 nm, 60 nm and 100 nm and measured on the LAMBDA 265 Personal UV/Visible Array Spectrophotometer with the UV Lab™ Software. The sample concentrations were approximately 2.9 x 10^{-4} Moles of gold per litre. The samples were placed in a 10 mm pathlength quartz cuvette and measured directly without dilution against a deionized (DI) water blank. The experiment setup is shown as Figure 1.

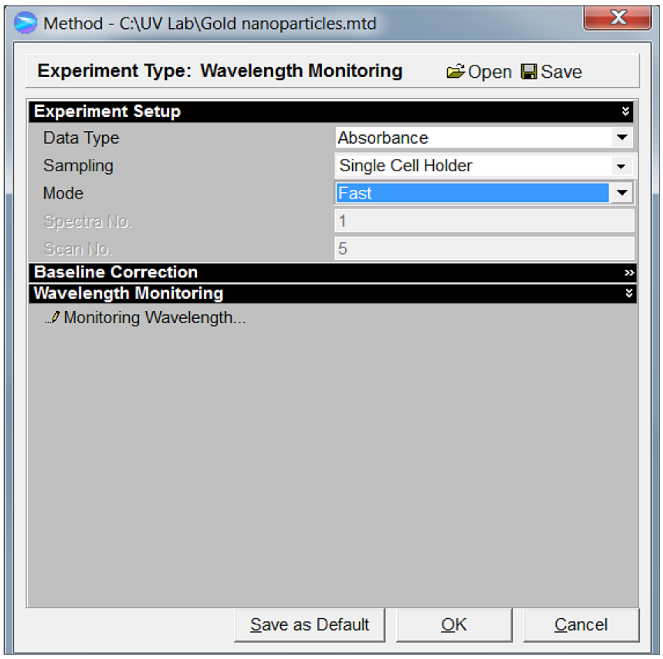

Figure 1. Experimental setup for measuring gold nanoparticles.

With increasing particle sizes the nanoparticles will start to settle out faster, so it is very beneficial to have a means in which to measure the UV/Visible spectrum as quickly as possible. The LAMBDA 265 is able to collect a full range spectrum from 190 nm -1100 nm in under two seconds.

The spectra obtained are shown in Figure 2.

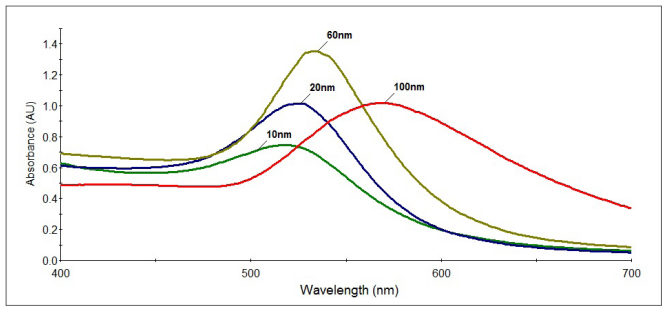

Figure 2. Absorption Spectra of four different sizes of gold nanoparticles in solution.

These spectra show the effect of shifting the absorption maximum towards the red end of the spectrum as the particle size increases.

Summary

The data shows the suitability of the LAMBDA 265 for producing rapid, high-quality spectra. It also shows that the instrument is able to measure the higher nanoparticle sizes, even though these scatter light to a greater extent due to the increased particle size and also settle out more quickly.

Reference

1. BBI Solutions www.bbisolutions.com.

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