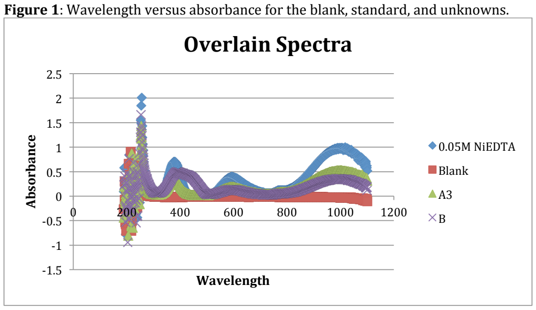
*Chem 212: Example Lab writeup, Lab 2*

*This is an example lab writeup. The text is in italics at the beginning of each section explains briefly what should go into that section. Graphs were taken from Williams, 2012 writeup.*

**1. Purpose** *What was the purpose of the experiment? What are you hoping to learn?*
Determine the concentration of Ni in two unknown solutions using a calibration curve and standard addition methods.

**2. Results** *Showcase your data in tables and graphs. Explain what you found (not what it means) in the text.*
**2.1 Wavelength selection**
The absorbance maximum and background wavelengths were selected at 592 nm and 480 nm, respectively (**Fig. 1**).

**Figure 1**: Wavelength versus absorbance for the blank, standard, and unknowns.



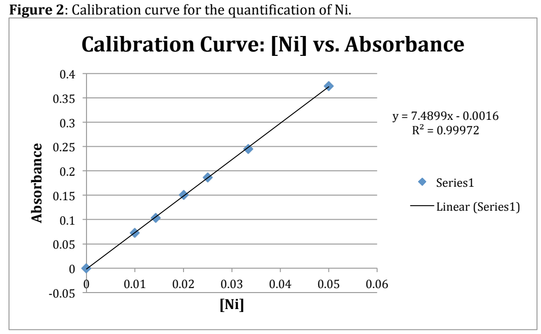

**2.2 Calibration curve**
The calibration curve method was employed to calibrate the UV-Vis in order to measure the concentration of nickel in two unknown solutions.

Using the data shown in **Table 1**, a calibration curve was constructed using least squares analysis. The line of best fit was determined to be A= 1.13±0.02 [Ni] + 0.04±0.02, with an $R^2$=0.95 (**Fig. 2**). See calculations on attached page.

**Table 1**: Ni quantification using a calibration curve

| [Ni] | Absorbance | $[Ni_{calc}]$ |
|---|---|---|
| 1M | 1.2±0.1 | |
| 0.5M | 0.6±0.1 | |
| 0.25M | 0.3±0.1 | |
| 0.12M | 0.2±0.1 | |
| Unk 1 | 0.56±0.1 | 0.73±0.04 M |
| Unk 2 | 0.23±0.1 | 0.20±0.03 M |
| blank | 0.05±0.01 | |

**Figure 2**: Calibration curve for the quantification of Ni.

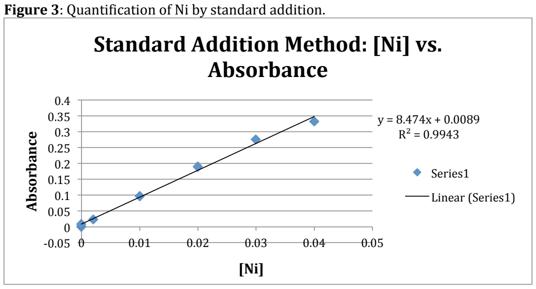



**2.3 Standard Addition**
The standard addition method was employed to quantify nickel in two unknown solutions. Least squares analysis was performed on the data shown in **Table 2**, and the line of best fit was determined to be A= 1.13±0.02 [Ni] + 0.14 ±0.02, with an $R^2$=0.97 (**Fig. 3**). See calculations on attached page.

**Table 2**: Ni quantification using a standard addition

| $[Ni_{added}]$ | Absorbance | $[Ni_{calc}]$ |
|---|---|---|
| 1M | 1.4±0.1 | |
| 0.5M | 0.7±0.1 | |
| 0.25M | 0.4±0.1 | |
| 0.12M | 0.2±0.1 | |
| 0 | 0.12±0.1 | 0.14±0.02 M |
| blank | 0.05±0.01 | |

**Figure 3**: Quantification of Ni by standard addition.




**3. Discussion** *Respond to the questions in lab in paragraph form Devote 1-2 paragraphs to discuss each question.*
Two methods were employed for measuring Ni in unknown solutions: a calibration curve and standard addition methods. **Table 3** summarizes the equations for each method (**Figs. 2-3**). Both methods have acceptable $R^2$ values (0.95 or better), and, although the value for standard addition is better, both are expected to yield good quantification results. The concentrations of Ni in the unknowns are reported in **Table 4**. The calibration curve yielded a significantly higher (95%CI) than the standard addition method. This indicates there may be matrix effects that were not accounted for in the calibration curve that artificially increased the apparent concentration of Nickel.

**Table 3**: Equations for quantifying Ni by method.

| Method | Equation | $R^2$ |
|---|---|---|
| Calibration curve | A= 1.13±0.02 [Ni] + 0.04±0.02 | 0.95 |
| Standard Addition | A= 1.13±0.02 [Ni] + 0.14±0.02 | 0.97 |

**Table 4**: Quantification of Ni in unknown solutions.

| Method | Unknown 1 | Unknown 2 |
|---|---|---|
| Calibration curve | 0.73±0.04 M | 0.20±0.03 M |
| Standard Addition | Not measured | 0.14±0.02 M |

I believe the main source of error in this experiment was in making the stock solution. I did not achieve a completely quantitative transfer between the weigh boat and the volumetric flask because there were still NiSO4 6H2O crystals adhered to the weigh boat. This would result in consistently lower absorbance values for a given concentration. Ultimately, in a lower [Ni] calculated in the unknowns. To avoid this, next time I would rinse the weigh boat into the volumetric flask.

Other sources of random error were weighing errors (random error from the balance), dilution errors (from the pipet not dispensing the appropriate volume), instrument error (from random error associated with instrument response), and errors in absorbance associated with pathlength and absorbance of cuvet.

**4. Conclusion** *Write a short paragraph concluding what you learned.*
This experiment quantified of Ni using UV-Vis using both calibration and standard addition methods. In both cases, the calibration curves were linear ($R^2$= 0.95 or better). However, matrix effects for some samples complicated quantification of the unknowns. In the case of these samples, the standard addition method did a much better job of quantifying the unknown concentration.

**5. Group dynamics**
I worked with Suzie Q during this lab. We each contributed equally to the experiment, but I feel I contributed 80% of the analysis and writeup.