

10/3/2017

Tasklist:

- Prepare ICP standards for Au (in range of 0-200 ppm)
  - Use ICP to measure [Au] in stock solutions, AuNP colloids, and AuNP fiber solutions
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➤ ICP

-Step 1: Create the ICP standards by measuring out 2mL of the 10mM HAuCl<sub>4</sub> into a falcon tube. Add 8mL of DI water to get a final volume of 10mL.

\*Note: 10mL= 200ppm

Step 1 was repeated with varying volumes of the 10mM HAuCl<sub>4</sub> to get different concentrations. The concentrations prepared are the following: 50ppm, 100ppm, 150ppm, and 200ppm.

-Step 2: Dilute both 10mM HAuCl<sub>4</sub> and 2.5mM HAuCl<sub>4</sub> stock solutions to 500ppm. This was accomplished by adding 2.25mL of the 10mM HAuCl<sub>4</sub> and 9mL of the 2.5mM HAuCl<sub>4</sub> into a falcon tube. DI water was added into the tube to bring the solution up to 45mL in volume. 2.25mL and 9mL were determined by the below calculations.

HAuCl<sub>4</sub> Stock Solution Calculation

$$M_1V_1=M_2V_2$$

$$(10\text{mM})(V_1) = (500\text{uM})(45\text{mL})$$

$$\mathbf{10\text{mM HAuCl}_4 \mathbf{V1 = 2.25mL}}$$

$$(2.5\text{mM})(V_1) = (500\text{uM})(45\text{mL})$$

$$\mathbf{2.5\text{mM HAuCl}_4 \mathbf{V1 = 9mL}}$$

-Step 3: 2mLs of the 5 samples from Step 1, the 2 stock solutions from Step 2, the AuNP colloids, and AuNP fiber solution (obtained from Dominique, Michael, Mackenzie, Anh group as our group did not form any fibers) were placed into the Agilent Technologies 5100 ICP-OES instrument to be analyzed. Since our samples did not form fibers, the data obtained from the other group's sample was not included in our data table. The samples were analyzed axially and radially at the following wavelengths: 208.207nm, 242.794nm, and 267.594nm. The viewing height was 8cm. Table 1 was created from the below calculations.

Actual Concentrations for 10mM HAuCl<sub>4</sub> and 2.5mM HAuCl<sub>4</sub> Stock Solutions

- 10mM HAuCl<sub>4</sub>  
 $(78.96\text{mg/L})\left(\frac{1\text{mol Au}}{196.97\text{g}}\right) = \mathbf{\sim 400.87\text{uM}}$
- 2.5mM HAuCl<sub>4</sub>

$$(68.09\text{mg/L})\left(\frac{1\text{mol Au}}{196.97\text{g}}\right) = \sim\mathbf{345.69\mu\text{M}}$$

[Au] for AuNP Colloid Solutions Calculations

- Expected Concentration

$$\frac{(1\text{mL HAuCl}_4)\left(\frac{2.5\text{mmol}}{\text{L}}\right)}{10\text{mL}} = \sim\mathbf{250\mu\text{M}}$$

- Actual Concentration

$$(23.31\text{mg/L})\left(\frac{1\text{mol Au}}{196.97\text{g}}\right) = \sim\mathbf{118\mu\text{M}}$$

Table 1: ICP Concentration Analysis of AuNPs

Solution Label	Expected Concentration ( $\mu\text{M}$ )	Actual Concentration ( $\mu\text{M}$ )	Percent Error
10mM HAuCl <sub>4</sub> Stock Solution	500	~ 401	~20%
2.5mM HAuCl <sub>4</sub> Stock Solution	500	~ 346	~30%
AuNP Colloid	250	~ 118	~53%
AuNP Fiber	---	---	---

Table 1 shows the expected concentrations obtained from existing literature and actual concentration obtained from ICP. The 10mM HAuCl<sub>4</sub>Stock Solution had about a 20% error. The 2.5mM HAuCl<sub>4</sub>Stock Solution had about a 30% error. The AuNP colloid had about a 53% error.