

# Sample preparation

Herein we will use sodium selenate ( $\text{Na}_2\text{SeO}_4$ ), transmission powder sample for example.

## 1 XAS transmission powder sample preparation:

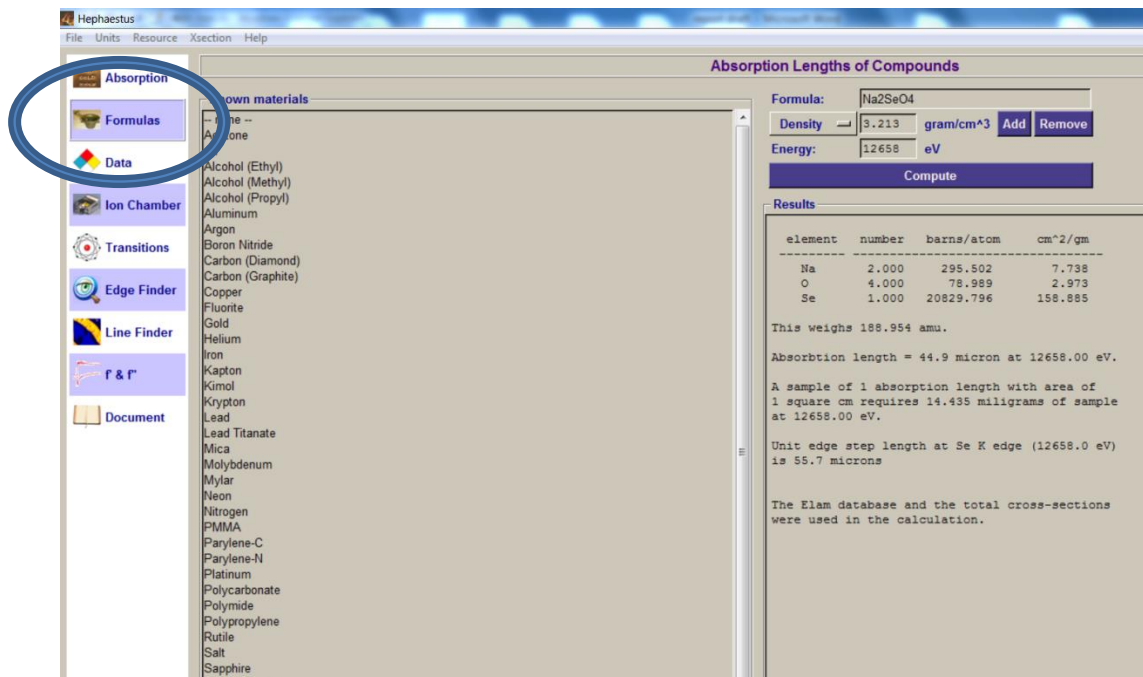
### 1.1 Sample preparation calculation by using by Hephaestus software

This is a rough calculation by giving an idea of how much sample needed in the beginning. The sample preparation can be further optimized by using experimental estimated edge jump.

- 1). Opened Hephaestus software
- 2). Clicked formulas on the left corner of the panel
- 3). Entered the chemistry formula, density and K-edge of  $\text{Na}_2\text{SeO}_4$

The results turned out that “a sample of an absorption length with area of 1 square cm requires 14.435 milligrams of sample at 12658.00 eV”. As the diameter of the pellet is 13mm, the following formula is used to calculate the amount needed in the pellet.

$$m(\text{Na}_2\text{SeO}_4) = \frac{14.435 * \pi r^2}{1\text{cm}^2} = \frac{14.435}{100\text{mm}^2} * 3.14 * \left(\frac{13\text{mm}}{2}\right)^2 = 19.16\text{mg}$$

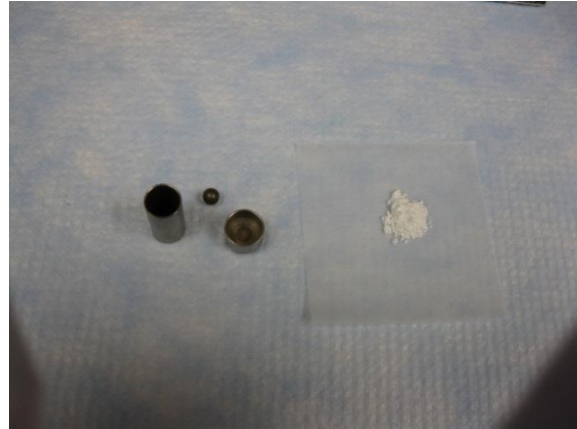


- 1.2 Transmission sample in form of pressed pellet ----- ‘ideal’ method in term of uniform sample without pinhole effect, constant thickness therefore sample preparation calculation is critical;

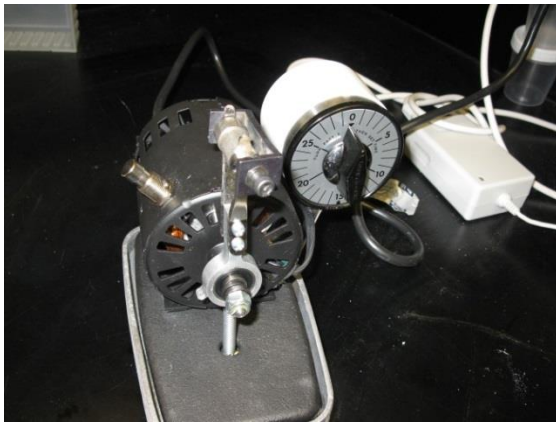
1.2.1 use a wig-l-bug to mix uniformly with boron nitride and then press to make a pellet



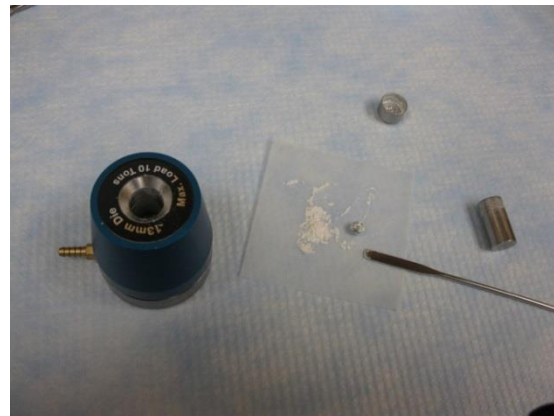
1). Weighted 19.16mg of sodium selenate and 50~100 mg of boron nitride with an electronic balance.



2). Mixed sodium selenate and boron nitride in the container with a metal ball. Sealed it with a tape in case of losing samples after shaking



3). Mixed samples using a wig-l-bug for 30 seconds.



4). Took out the mixed sample from the container.



5). Transferred the mixed sample to a pellet-forming die.



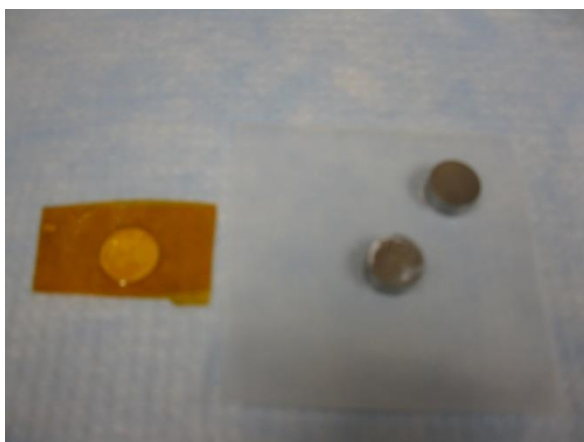
6). Assembled the pellet-forming die



7). A force of approximately **10000** pounds is applied for a few seconds to form pellets.



8). Took out the pellet from the pellet-forming die.



9). Placed the pellet in between the two layers of kapton tapes and sealed both sides.

2.1.2 Use a mortar or pestle to mix uniformly with Boron Nitride and then press to make a pellet



1). Weighed 19.16mg of sodium selenate and 50~100 mg of boron nitride with an electronic balance.



2). Mixing sodium selenate with boron nitride with by using mortar or pestle.





3). Transferred the mixed sample to a pellet-forming die



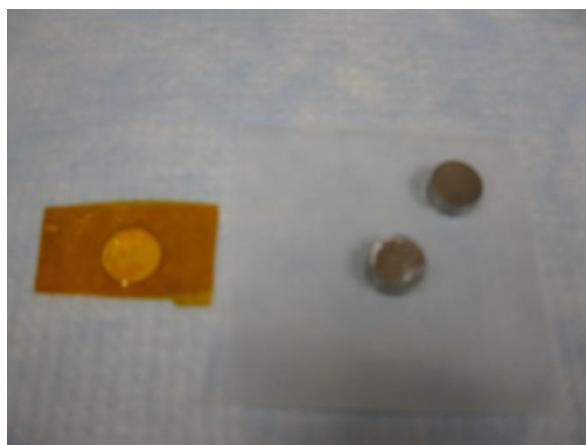
4). Assembled the pellet-forming die.



5). A force of approximately 10000 pounds is applied for a few seconds to form pellets.



6). Took out the pellet from the pellet-forming die.



7). Placed the prepared pellet in between two layers of kapton tapes and sealed both sides.