

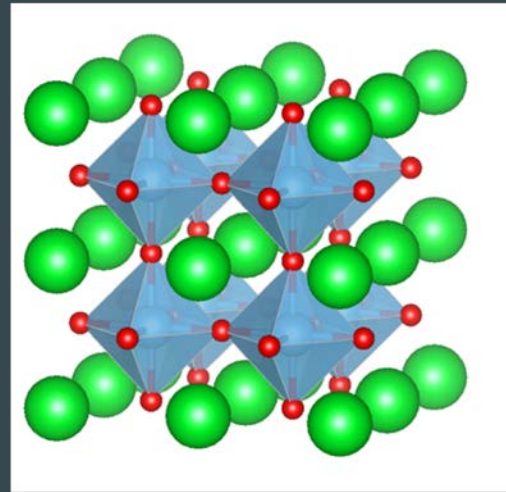
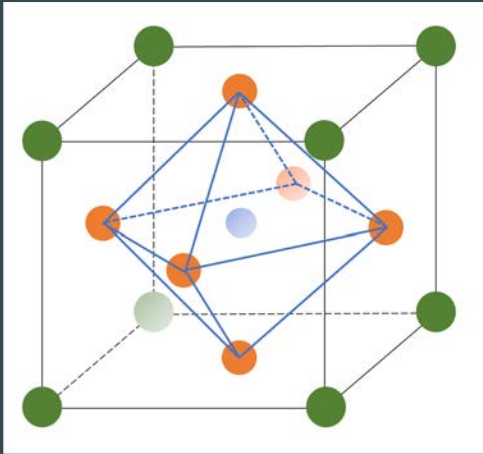
PEROVSKI-WHAT??





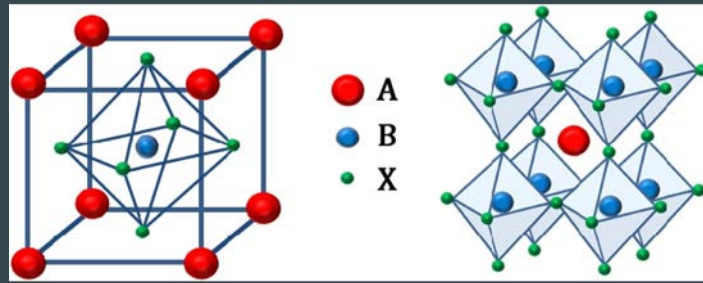
What is a perovskite?

A group of related minerals and ceramics having the same crystal structure as this...



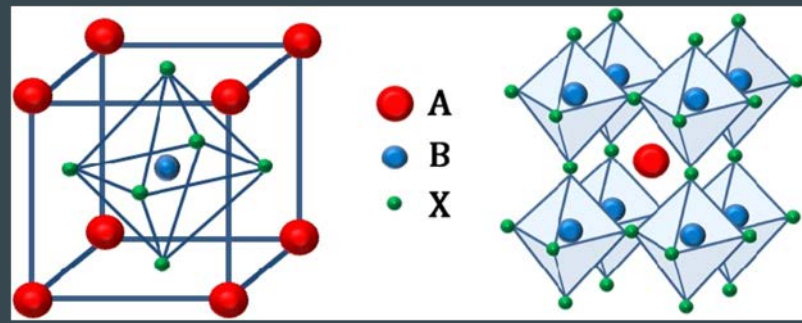
https://www.youtube.com/watch?time_continue=3&v=fVqsCRvPAY4

History of Perovskites



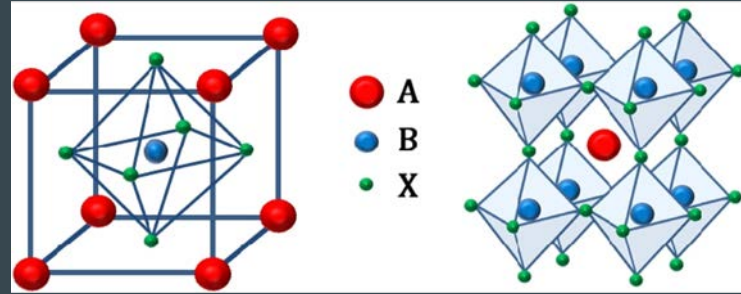
- A **perovskite** is any material with the same type of crystal structure as calcium titanium oxide (CaTiO_3), known as the *perovskite structure*, or ABX_3 with the oxygen in the edge centers. Perovskites take their name from the mineral, which was first discovered in the Ural mountains of Russia by Gustav Rose in 1839 and is named after Russian mineralogist L. A. Perovski (1792–1856).

Structure of the perovskite



- The general chemical formula for perovskite compounds is ABX_3 , where 'A' and 'B' are two **cations** of very different sizes, and X is an **anion** that bonds to both. The 'A' atoms are larger than the 'B' atoms. The ideal cubic structure has the B cation in 6-fold coordination, surrounded by an **octahedron** of anions, and the A cation in 12-fold cuboctohedral coordination.

Perovskite Structure



- In the idealized cubic unit cell of such a compound, type 'A' atom sits at cube corner positions $(0, 0, 0)$, type 'B' atom sits at body-center position $(1/2, 1/2, 1/2)$ and oxygen atoms sit at face centered positions $(1/2, 1/2, 0)$. (The diagram shows edges for an equivalent unit cell with A in the body center position, B at the corners, and O at mid-edge positions).

Perovskite Structure Video

- More in depth video on perovskite structure!
- <https://www.youtube.com/watch?v=sc0uWcOZSNU>

My Summer Project

Problem: Can a perovskite be used as an ink, to print a capacitor?

Hypothesis: If silver, tantalum, and niobium oxides are combined to form ANT, then the powder could be used in an ink to print a capacitor using an ink jet printer.

Experiment:

ANT will be created by calcining the proper batch in a furnace. The ANT will then be used in solution to form an ink, that will print in a Dimatix inkjet printer.

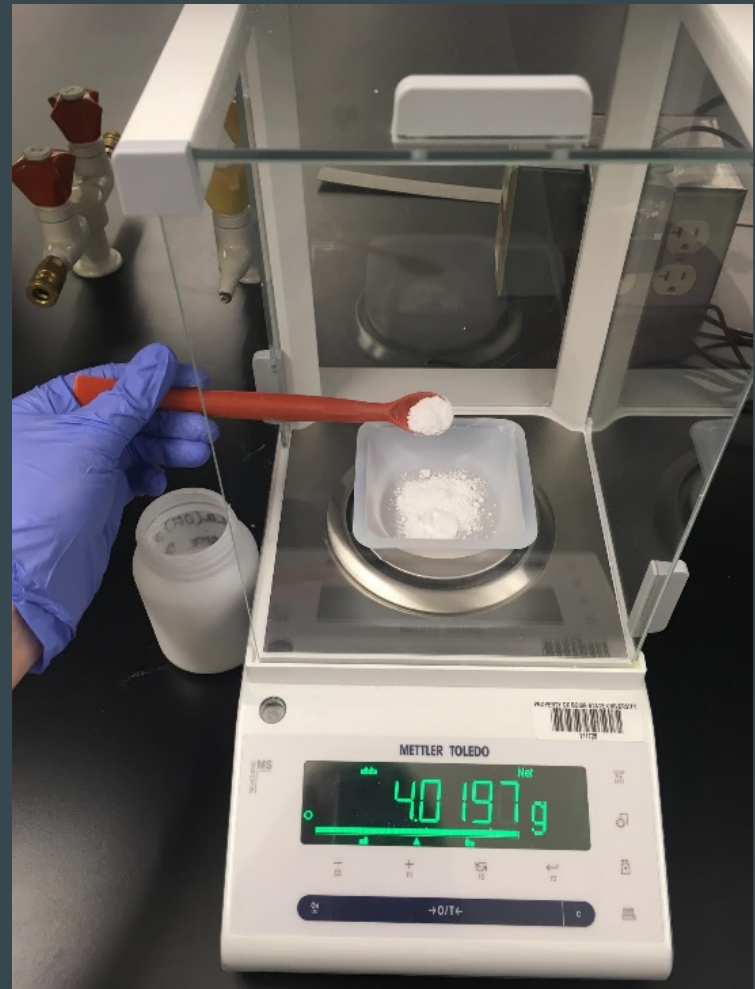
Data:

Analysis:

Conclusion:

Laboratory Procedure

Measuring all the proper amounts of chemical powders for the “batch”



Laboratory Procedure

The powders must be “milled”, or mixed thoroughly, together in a solution of pure water before they can be calcined.



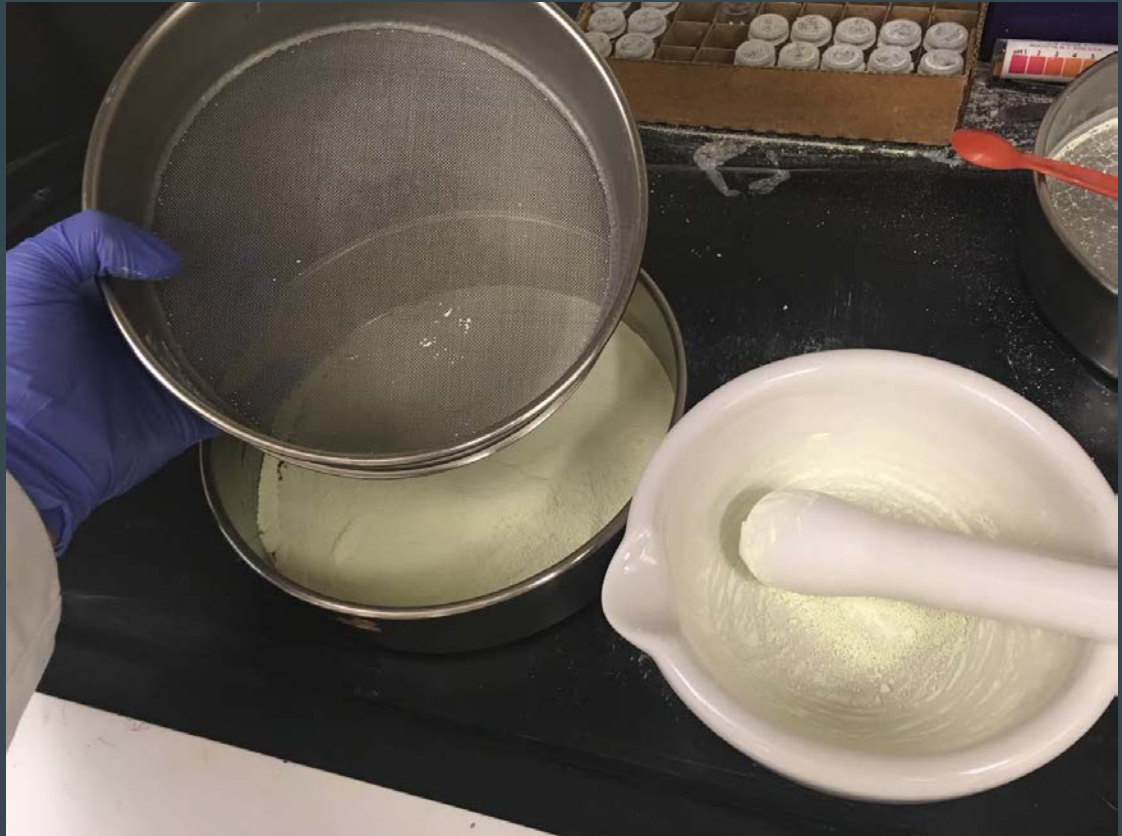
Laboratory Procedure

Next step is to dry the solution so that only a powder is left



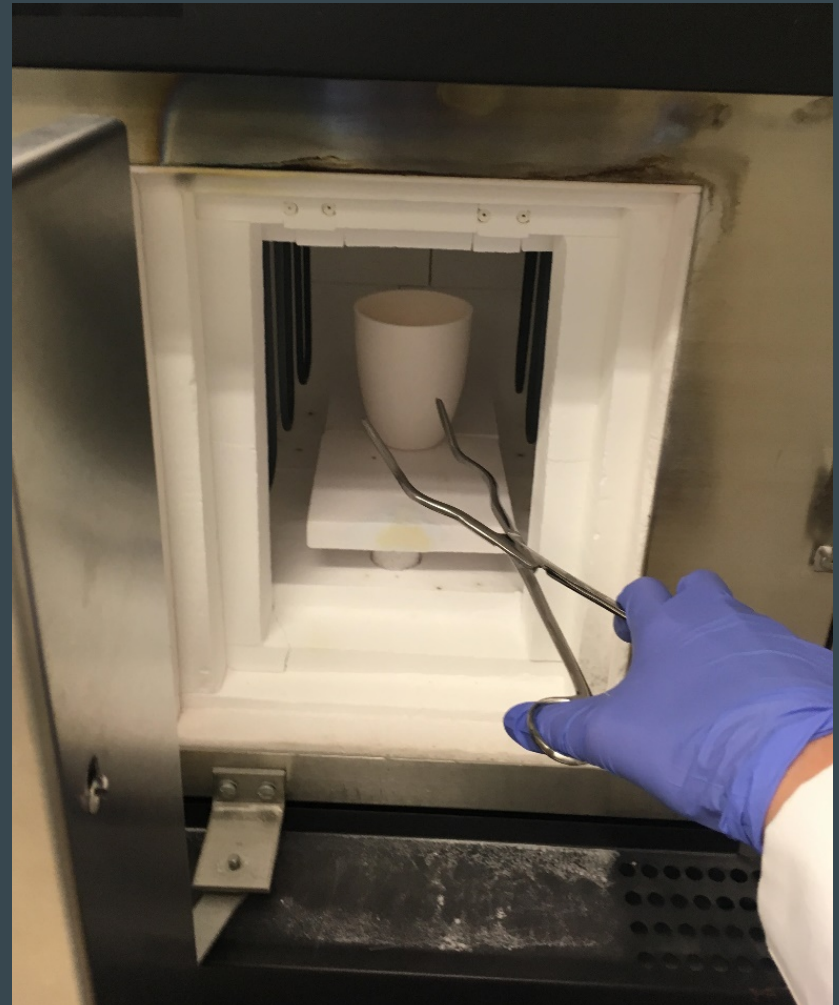
Laboratory Procedure

Once completely dried, it's crushed into a fine powder, as fine as sifted flour



Laboratory Procedure

The box furnace is where the magic happens! This is where the powder is heated to extremely high temperatures and chemically combine to form the new substance



Calcining - Basically cooking up stuff in the lab!

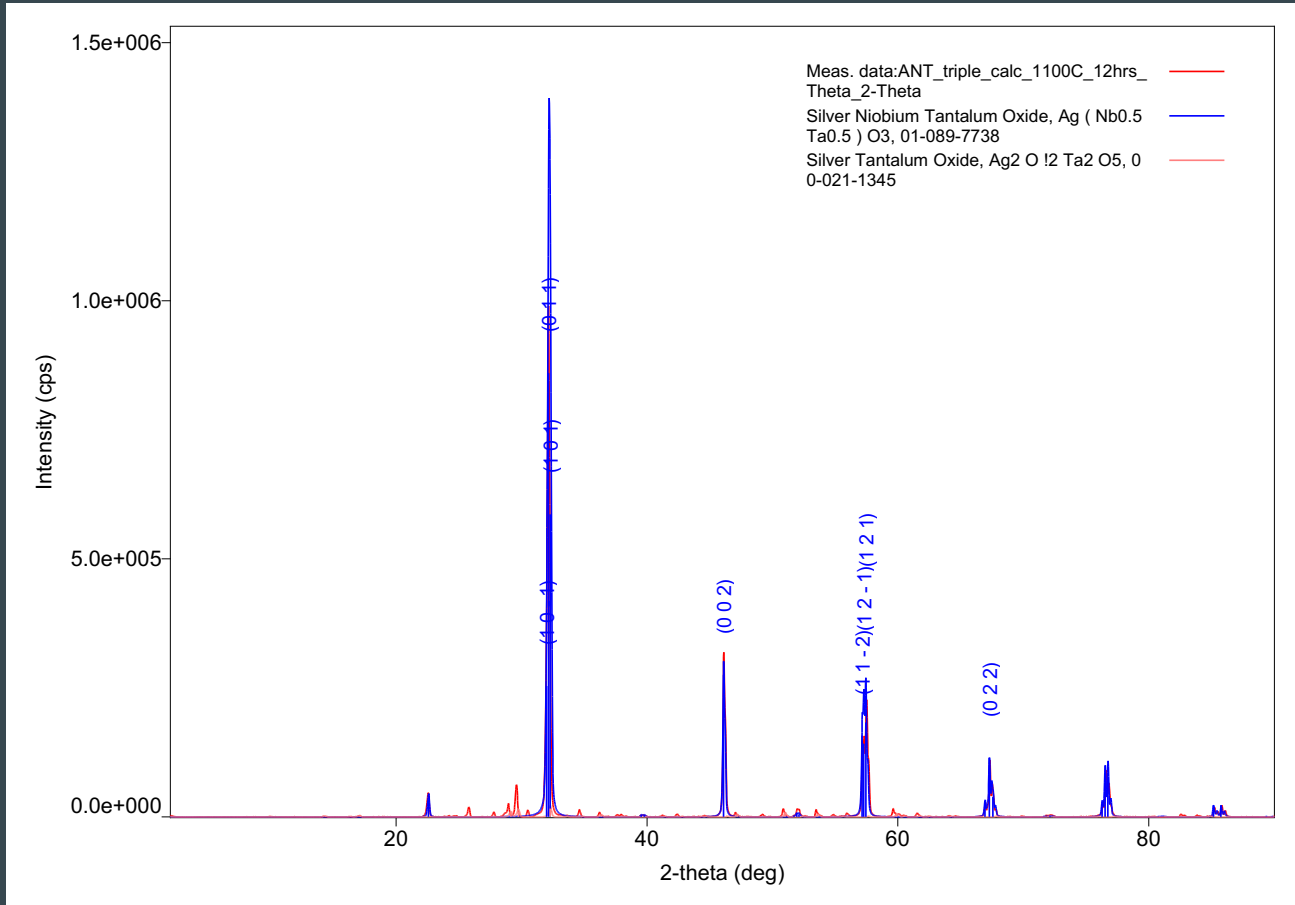


Laboratory Procedure

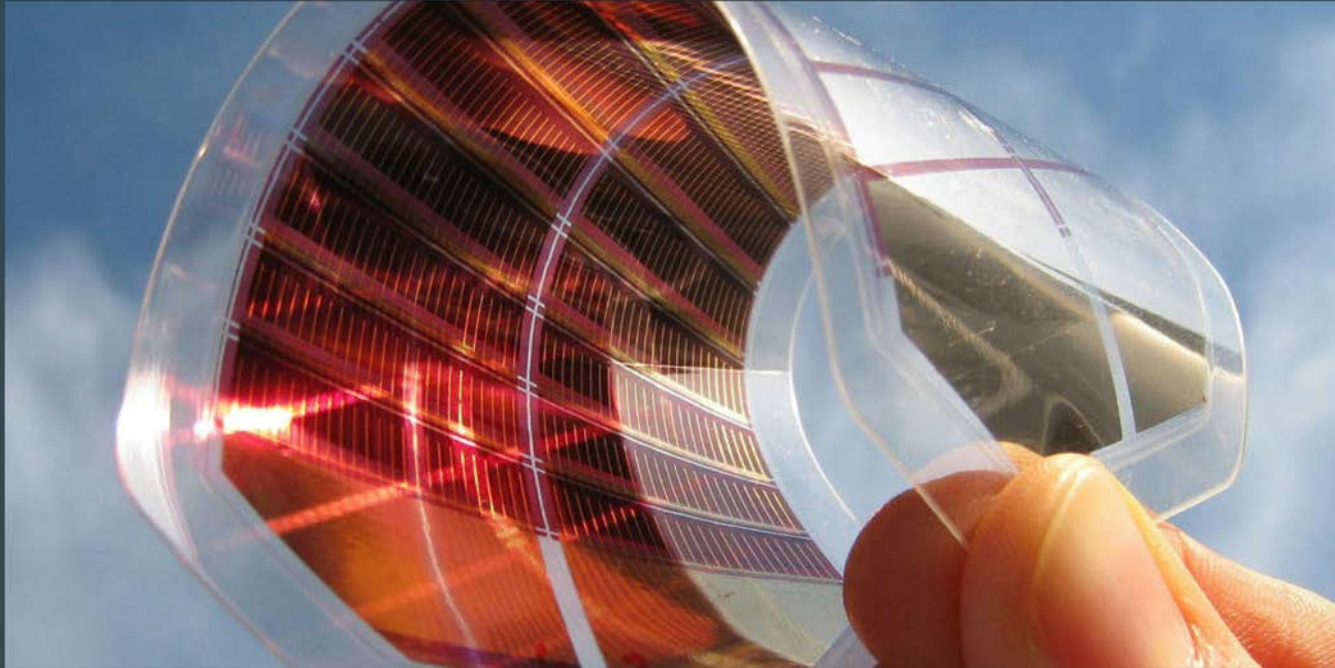
After the furnace and another grinding into a fine flour like powder, the X-ray Diffraction machine will analyze the substance and what is we created in the furnace



XRD Results



How are perovskites going to be used? Solar Power and Electric Circuits



TED ED <https://www.youtube.com/watch?v=2ccar3uqWsw>

More videos...

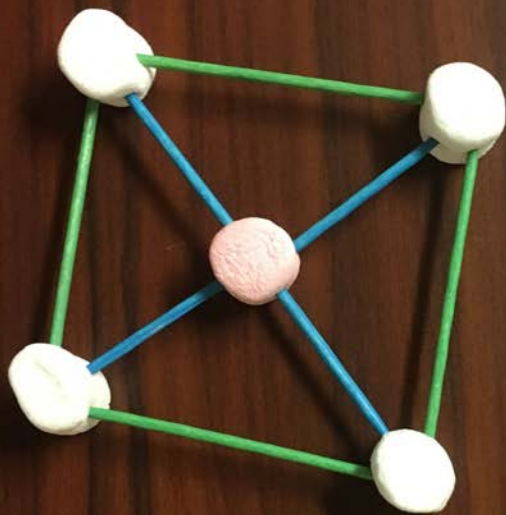
- Perovskites for undergrads <https://www.youtube.com/watch?v=d2npedzLFaA>
- Constructing Solar Cell <https://www.youtube.com/watch?v=ZdpQgPJ1Plk>

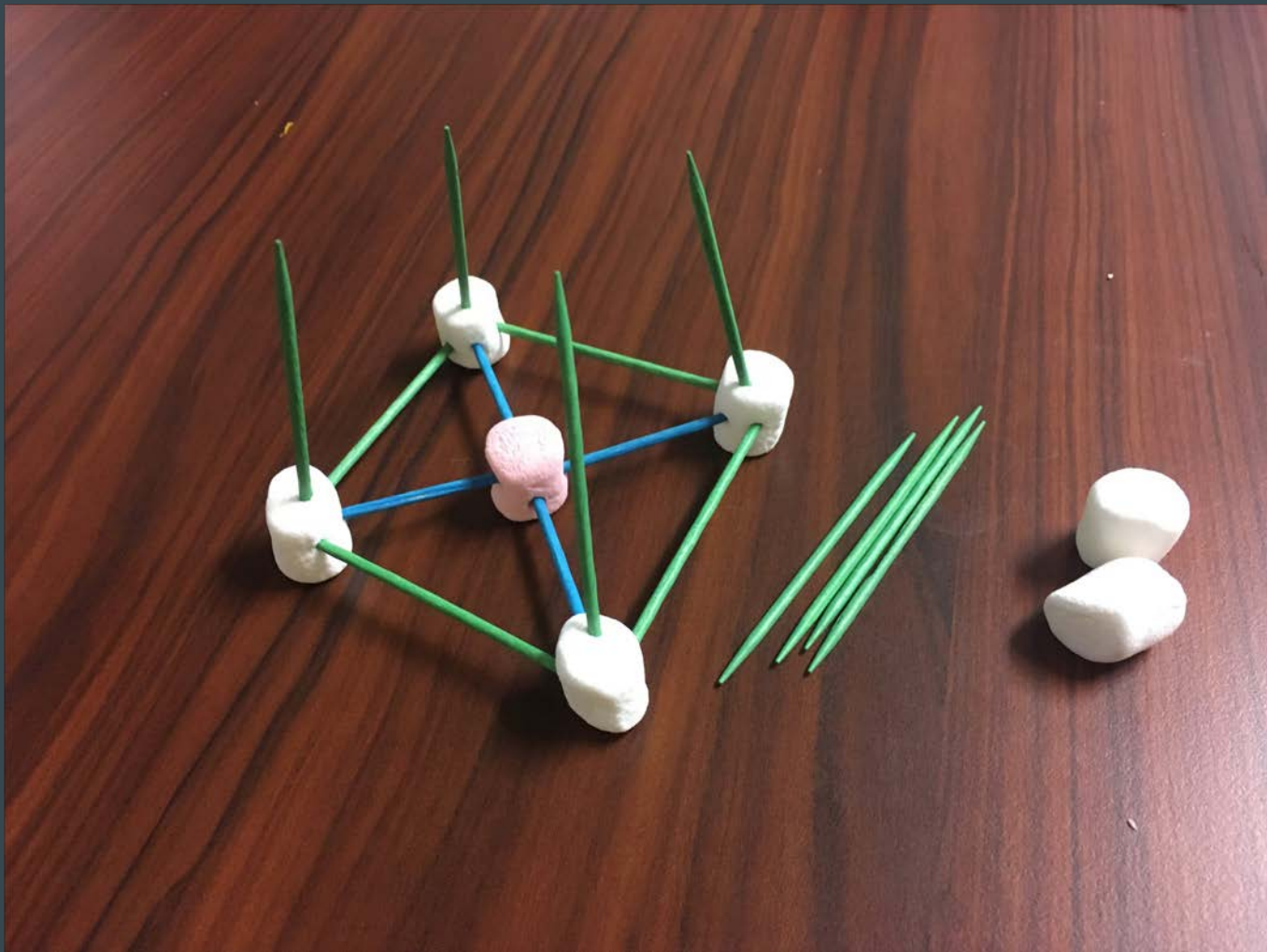
Time for an activity!

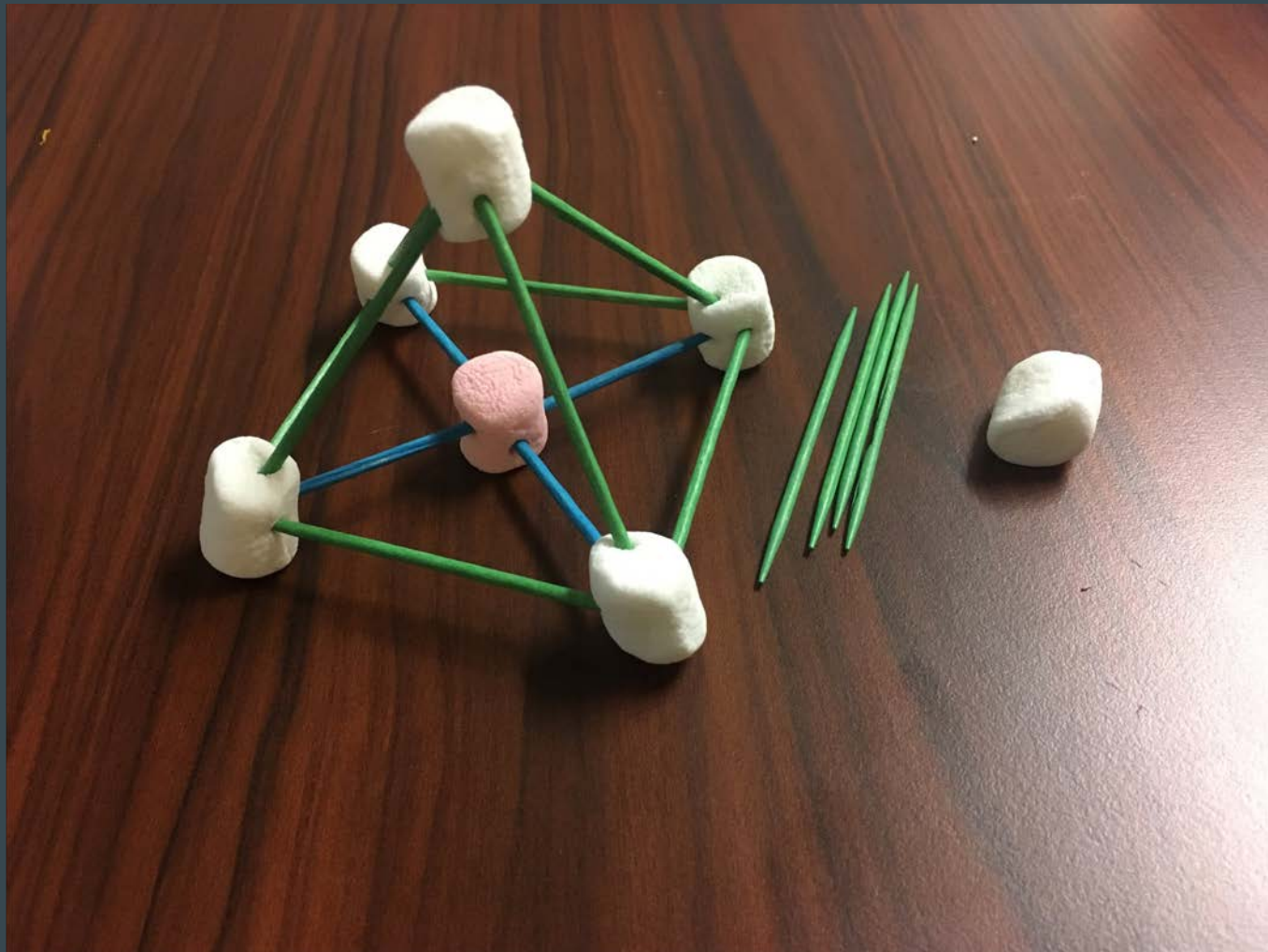


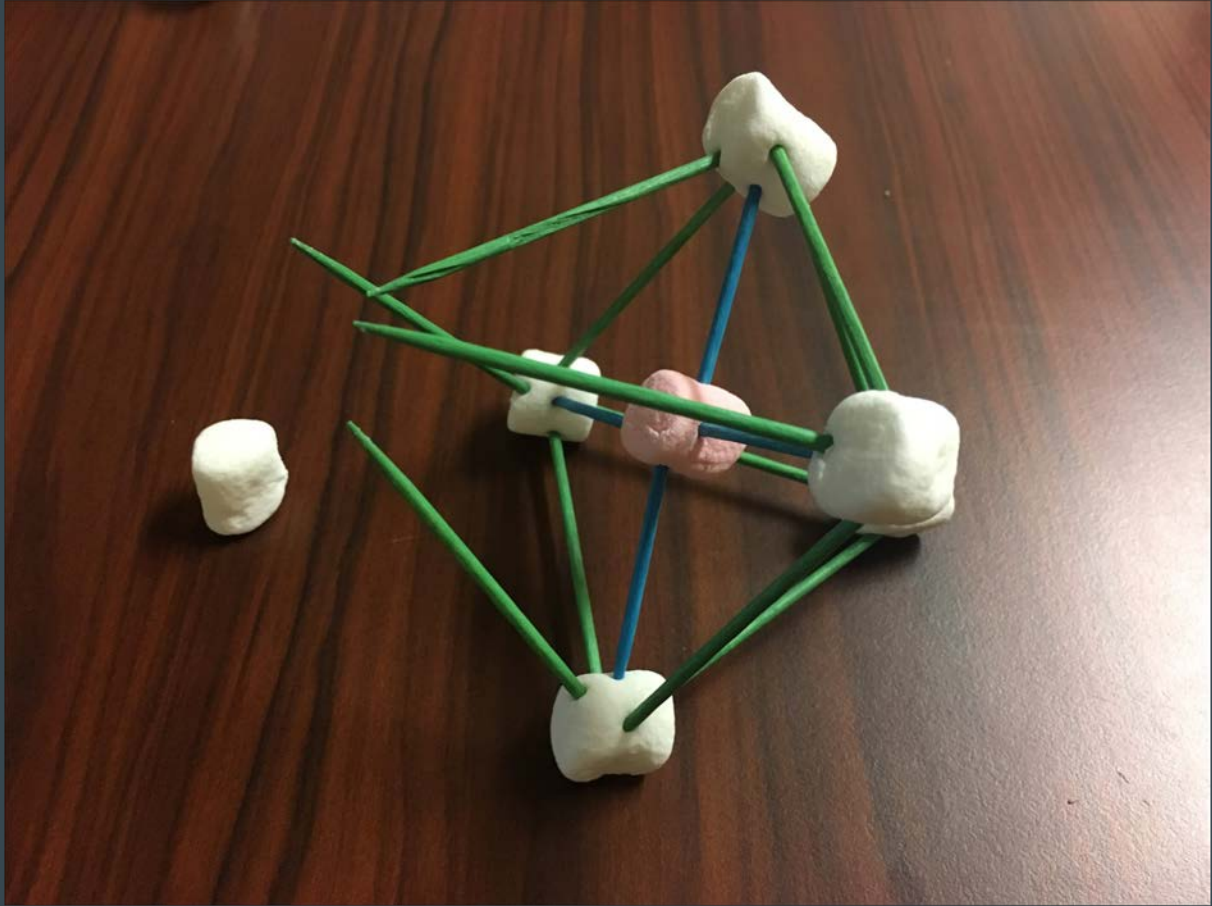


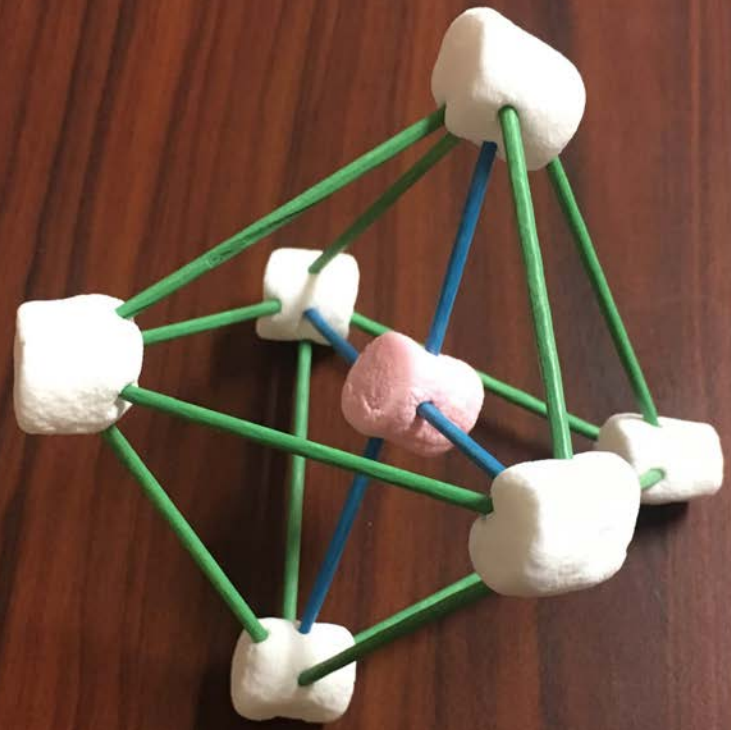


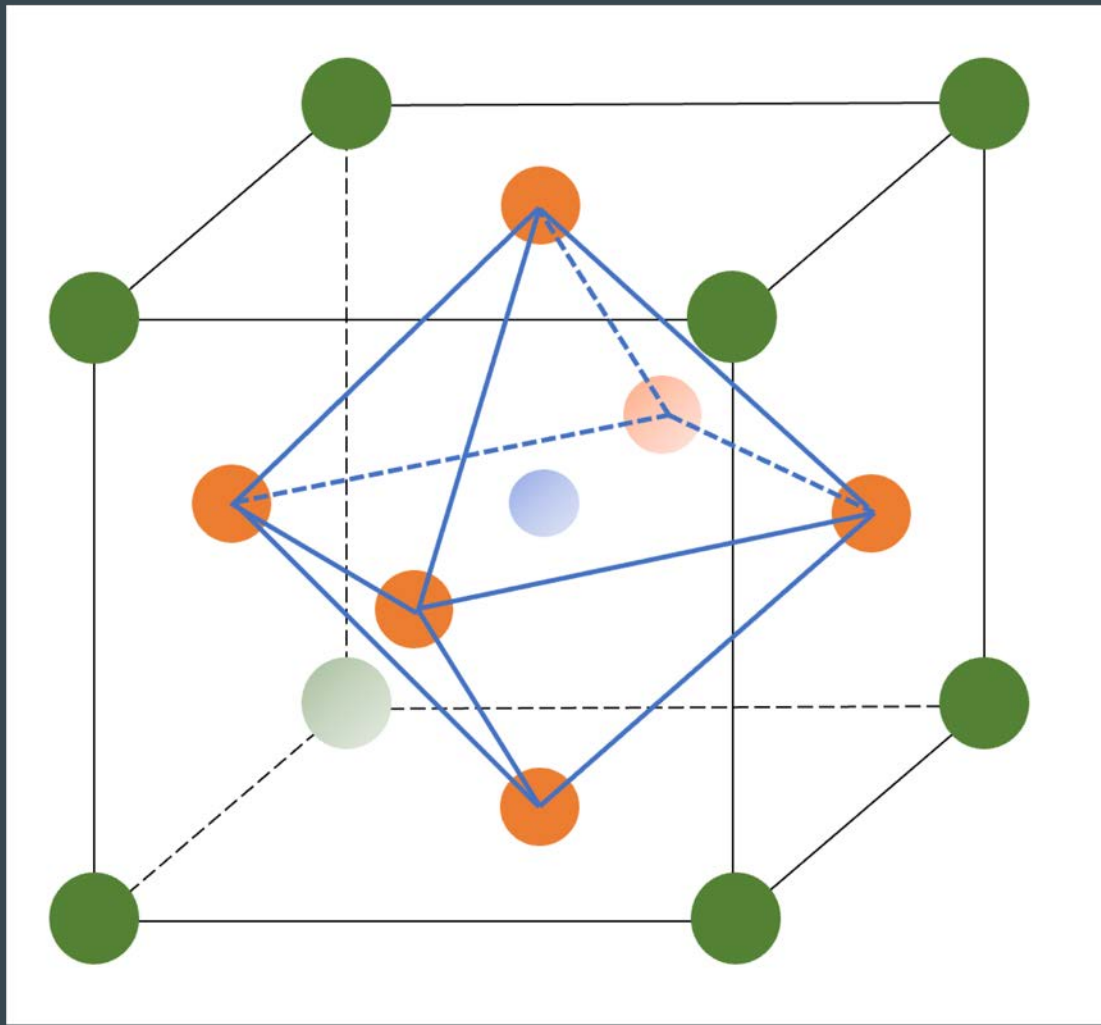














Thank you!

Works Cited

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