Using 3D Printing Technology to Recreate Historically Accurate Teaching Models from the 1800s
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Introduction
- 3D printing provides endless possibilities to innovate, create, and modify how learning can take place in a classroom.
- 3D models are easy to produce and edit, and allow room for initial error.
- It is an effective way of allowing students to transform their ideas into actions.
- Learning about crystal structures are often too abstract for introductory chemistry students to grasp.
- Our goal is to grow crystals and 3D print to model the complex equations that create major crystalline lattice structures.
- These particular models can be used by introductory or higher chemistry courses for visual and hands on learning.
- The seven major crystal lattice systems include cubic, tetragonal, orthorhombic, hexagonal, trigonal, triclinic, and monoclinic.

Crystal Growing Process
- First, a saturated mother liquor is made based on the solubility of the ionic compound.
- Once the mother liquor is super saturated, seed crystals will begin to deposit on the bottom and sides of the beaker.
- Next, a seed crystal is suspended in the saturated solution using fishing line. Saturation of the solution and rate of evaporation both need to be monitored throughout this step.
- Finally, the crystals are sealed in resin to prevent dehydration and prepare them to be handled by students.

3D Printing
- 3D printing allows for the rapid design and manufacture of prototypes at a relatively low cost.
- Depending on the size, a model can take ten minutes to two hours to be completely printed. For these models, the longest print was over four hours!
- This process works by heating thin plastic to 230°C and extruding filament onto a 90°C platform.
- There are many different types of 3D printers and they can vary in cost, but once the initial costs are paid, the cost of printing is relatively low.

D Printed Models

Finished Models
- Print time for each ranged from one hour to anywhere upwards of three hours depending on the design’s complexity.
- Extruder heated to 210°C
- Printed with the Creator Pro and XYZ printers and accompanying software
- Included structures such as:
  - Octahedron
  - Rhombic Pyramid
  - Hexagonal Prism
  - Pentagonal Dodecahedron

Happy Little Accidents
- Things don’t always go as planned. Although these specimens are not useful as teaching tools, they are still interesting and demonstrate varieties of crystal structures.

Selected References

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