PS157 Progress Report

by
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Introduction:

X-ray diffraction was first discovered all the way back in 1912 by Walter Friedrich and Paul Knipping. This discovery is the basis for our project, which involves a source that produces x-rays, a crystal sample and a photographic film which can display the pattern that emerges from the crystal.

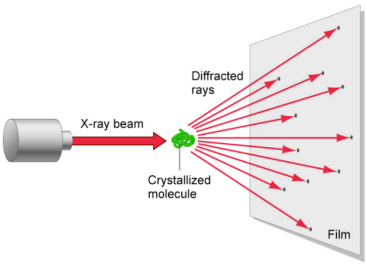

Fig 1.1 Diagram of X-ray Diffraction

Once the project has been successfully carried out, the goal is to have enough data from the pattern that is produced by the crystal to make quantitative claims about the atomic structure of the crystalline samples tested. These findings will then be recorded and analysed before finally being presented in a presentation that is set to take place on the 16th of april

Equipment Needed:

X-ray diffractometer, various crystal samples, diffraction gratings, lasers (varying wavelengths)

Optical Simulation:

Instead of only focusing on the information which can be gathered from using X-ray diffraction, our project also includes an Optical Simulation which will hopefully replicate the theory behind X-ray diffractometers. The idea for this Optical Simulation was suggested by our supervisor Dr. Henry Barry, and is based on an article published in 'The Physics Teacher' titled "Optical Simulation of Debye-Scherrer Crystal Diffraction"[1] by F. Logiurato, L. M. Gratton, and S. Oss. The article attempts to produce a simple inexpensive optical experiment which can replicate the appearance of X-ray diffraction.

Progress:

So far progress has been made coming up with ideas on how to get the diffraction gratings (which will stand in as a crystallised molecule for our Optical Simulation), to spin. Methods such as using a powered motor to spin the slide vertically, or having the slide on an axel which it can freely rotate about, have been hypothesised. Information has been collected from a range of sources such as Youtube videos on the topic of X-ray Diffraction.

References:

[1] "Optical Simulation of Debye-Scherrer Crystal Diffraction" by F. Logiurato, L. M. Gratton, and S. Oss. https://doi.org/10.1119/1.2834534 The Physics Teacher 46, 109 (2008).

[Fig. 1.1] "XRAY CRYSTALLOGRAPHY 101: The Who's What's and Why's" by University of California, Los Angeles. http://www.chem.ucla.edu/~harding/ec_tutorials/tutorial60.pdf