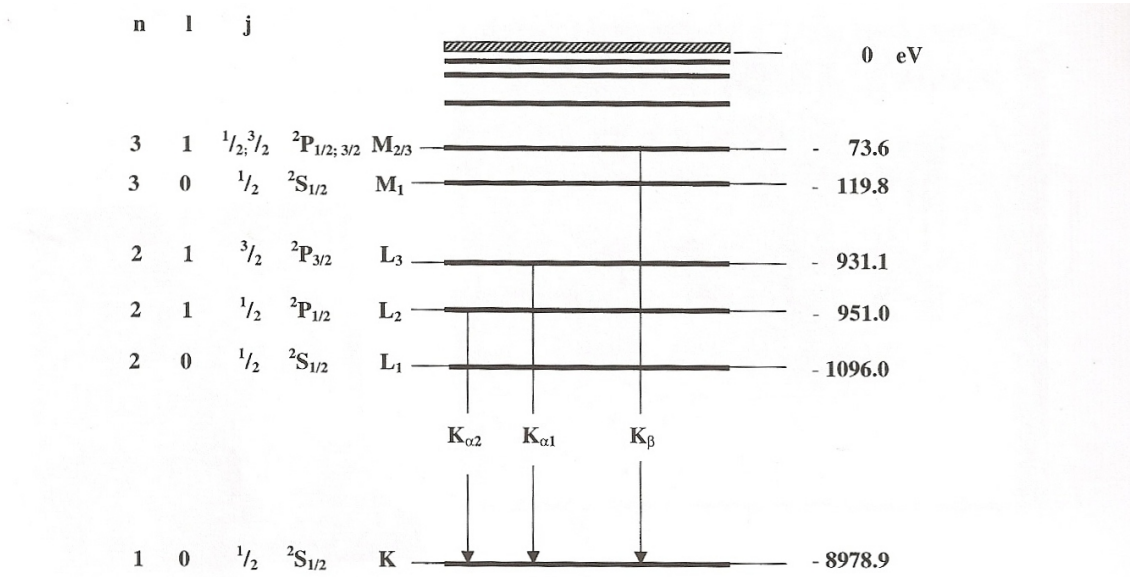
X-ray Diffraction PreLab
Rochester Institute of Technology

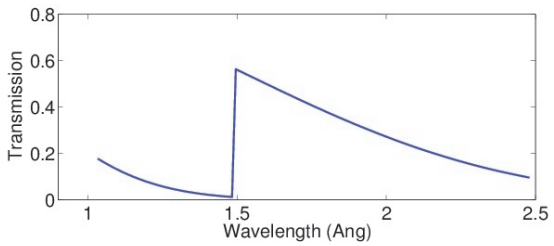
PHYS-316 Advanced Lab*

January 15, 2020

1. Read the X-ray diffraction Background document and make sure you understand it.
2. Using the energy-level diagram below, calculate the energies (in keV) and wavelengths (in Angstroms) of the $K_{\alpha 1}$, $K_{\alpha 2}$, and K_{β} transitions in Copper.



3. Having multiple, strong x-ray wavelengths is usually not helpful. Thus we need to reduce the spectrum so as to have primarily one X-ray wavelength that illuminates our samples. Here is a plot of the transmission of x-rays through a Nickel filter as a function of wavelength. Given the emission energies from the Copper diagram above, why might



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this Ni filter be a good choice for our Cu X-ray source?

4. Express 2.014 Angstroms in nm and pm.

5. Look up the wavelength of the Copper K_α photon. What is it? What source did you use? Is this value consistent with the energies calculated earlier? Why might it be a little different?

6. The crystalline structure (or lattice) in a material is the ordered arrangement of the atoms at very short length scales. Individually look up the terms **Single Crystal**, **Polycrystal**, and **Amorphous Solid** and briefly describe the relative ordering in each.

7. Why can a material such as tape or Vaseline can be used to hold or suspend the powders without contributing to the scattering signal?

8. Do not defeat the interlock!