Characterization of Materials 635:309

NAME_____ Dr. Garofalini

See due date on Website Syllabus

ANSWER ON THIS PAGE ONLY (front and back)

1. (a) Assuming use of a lead (Pb) shield for the protection of personnel in an x-ray diffractometer is 0.05mm thick. Calculate the 'transmission factor' (I_x/I_o) of such a shield for the Cu Kα. (Appendix 8 in Virtual Lab has necessary data-assume density from the Appendix.)
(b) How thick would the shield have to be in order to get the same transmission factor as in (a) if it was composed of 40% Pb and 60%Al (by weight) and a density of 3.88g/ cm^3.
(c) Assuming the density listed for each element in Appendix 8 and the above weight percents, prove that the density of that alloy is 3.88 g/cm^3.

2. Aluminum can be used as a window (lets 'light' through) for Ag K_α line. Aluminum's mass absorption coefficient for this line is 2.74 cm^2/gm. What maximum thickness of Al foil can be used as the window in this application if no more than 2% of the radiation can be absorbed by the window (use an Al density of 2.70 g/cc).

Table I gives the energies of certain absorption edges from several elements. Note that the values are in energy (eV). Also given is the mass absorption coefficient for Mo Kα x-rays.

TABLE I

atom-atomic #	K edge (eV)	L edge (eV)	$\mu_m(cm^2/g)$
Cr - 24	5987	574	29.25
Co - 27	7707	779	41.02
Zn - 30	9665	1033	55.46
Ge - 32	11100	1217	60.47
Mo - 42	20032	2480	18.44

3) How much energy must an incoming particle (electron or photon) have to eject an L shell electron from Mo? ANS_____

4) Ignoring subshells, what is the energy of the Kα x-ray for Zn? ANS_____