PHYS 485 Materials Physics **Spring 2019**

Read: Chapters 3 & 4

Homework 06

Due date: 29 Mar 19

Work problems 3.3, 3.5 in the text.

AQ 1: (A) A 3.77 m bar of coefficient of linear expansion equal to 25 x 10^{-6}/ºC is held fixed between two immovable supports that have expansion coefficients of zero. If the bar experiences a temperature rise of 32ºC, what will be the resulting stress in the bar?

(B) A small crack develops in the bar and the stress is relieved by the upward displacement of the center of the bar by a distance *x*; find the distance *x*.

AQ 2: In a Bragg reflection experiment using aluminum at 300 K a sharp peak is observed at an angle of 15.46º. At 800 K the same peak has a Bragg angle of 15.27º. Use this information to calculate the coefficient of linear expansion for aluminum.

And here are a couple of XRD problems like the one we did in class last week. Follow the same procedure that we did with that handout. A spreadsheet will likely be quite helpful with these. If you use one, be sure everything is well-labeled and email me a copy.

AQ 3: Powder specimens of three different monatomic cubic crystals are analyzed with a Debye-Scherrer camera. It is known that one sample is FCC, one is BCC, and one has the diamond structure. The approximate positions of the first four diffraction rings in each case are in the table below.

A. Identify the crystal structures of A, B, and C.

B. If the wavelength of the incident X-ray beam is 1.5 Å, what is the length of the side of the conventional cubic cell in each case?

Values of φ for samples (in degrees)

A	B	C
42.2	28.8	42.8
49.2	41.0	73.2
72.0	50.8	89.0
87.3	59.6	115.0

AQ 4: The following diffractometer data (expressed as 2θ) were generated from a specimen irradiated with silver (Ag) K_α radiation: 14.10°; 19.98°; 24.57°; 28.41°; 31.85°; 34.98°; 37.89°; 40.61°.

A. Determine the crystal structure.

B. Calculate the lattice constant, a.