

### Extra Homework (4%)

#### Instruction

1. Do it by yourself!! **Do not COPY!!!**
2. Give the references you used at the end of each item.
3. Handwriting only

### Part I : The Lanthanides and Actinides

1. What are the electronic configurations of these elements?

1. Am                      2. La                      3. Nd                      4. Ce

2. What is the Frost Diagram? How could it be used to predict the stability of an oxidation state of various oxidation states of the ions?

### Part II Crystal Structure

1. Draw these planes in the coordinate axes (XYZ)

1. (101)                      2. (111)                      3. (100)

2. What is close packing of atoms or spheres? State clearly the coordination number of the close packing of sphere.

3. If the spheres are close packed, how many types of interstitial holes (or sites) that are created? How many of each sites occur per one sphere?

4. Calculate the packing efficiency of (a) cubic packing, (b) hexagonal close packing and (c) cubic close packing.

5. If ion A and B form the compound AB. Ionic size of A and B are 700 pm and 520 pm. What kind of ion (A or B) that that are first packed ? And what kind of hole that another ion will be located?

*(Clue : calculate the radius ratio, assuming the larger ions are packed first, creating the holes for smaller ions)*

- Calculate the lattice enthalpy ( $\Delta H_{\text{xtal}}$ ) of NaCl, CsCl. (find the ionic radius from the internet)
- Fluorite structure, in case of CaF<sub>2</sub>, Ca<sup>2+</sup> ions are cubic **close** packed (or face-centred close pack), F<sup>-</sup> ions are fully filled in the tetrahedral hole. Why the structural formula is CaF<sub>2</sub>? (Clue : why not CaF, CaF<sub>3</sub>, think about the types of interstitial sites create from the close packing)
- Explain the crystal structure of ZnS (Wurtzite) .... (Clue which ions are close pack, which one is in the interstitial holes, radius ratio)
- What is alloy? What are the differences between two solid solution mentioned in the class?
- Calculate the number of atoms in NaCl structure, CsCl structure, Wurtzite structure.
- What is Bragg's law?

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