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| HW 2 | Inorganic Materials Chemistry | Name: | |
| Points: | C7780 | Date: | |
| Max. 100 points | Fall 2008 | A | |

1. Assume that CaO reacts with CeO₂ and forms CaCeO₃. What could be the structure type of this compound? _____

Write balanced chemical equations for the reactions taking place at the interfaces (assume counter diffusion of both cations) and calculate the Kirkendall ratio for this process.

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|------------|--------------------------|------------------------|--|
| | I | II | |
| CaO | CaCeO₃ | CeO₂ | |

2. X-ray radiation of a Cu anode ($\lambda = 1.54 \text{ \AA}$) was diffracted under an angle of 14.22° at silicon crystal. Calculate the interplanar distance d in Si for the first order diffraction ($n = 1$).

3. Derive Miller indices for planes that intersects the cell axes at $a/2$, $2b/3$, $2c$.

4. Specific surface area of $\alpha\text{-Fe}_2\text{O}_3$ was measured by nitrogen adsorption at 77 K and its value is $120 \text{ m}^2 \text{ g}^{-1}$. Density of this oxide is 5.277 g cm^{-3} . Calculate the particle size assuming a spherical particle shape.

5. Maghemite $\gamma\text{-Fe}_2\text{O}_3$ crystallizes in a defect inverse spinel structure (as Fe_3O_4), but some positions of Fe^{3+} in octahedral holes must be vacant, in order to maintain stoichiometry. What part of these holes must be empty in comparison with Fe_3O_4 .

□ = empty hole, (X) = tetrahedral position, [Y] = octahedral position

(Fe)___ [Fe___, □___] O₄