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Homework 3

**3.1 Lead orthosilicate forms a glass of density 7.36 g/cc. What is the oxygen density of this glass? How does this compare with fused silica (density 2.2 g/cc)? Where would you predict the lead ions are going?**

Lead orthosilicate density: 7.36 g/cc

Lead orthosilicate molecular formula:

Atomic weight of Pb: 207.2 amu

Atomic weight of Si: 28.0855 amu

Atomic weight of O: amu

Molecular weight of lead orthosilicate:

Ratio of oxygen mass to total mass:

Density of oxygen is therefore:

Fused silica molecular formula: SiO2

Molecular weight of fused silica:

Ratio of oxygen mass to total mass:

Density of oxygen is therefore:

I would predict the lead forms a network with SiO4 with each lead attaching to 2 oxygen:

O O

O-Si-O-Pb-O-Si-O

O O

**3.6 If you were asked to obtain a glass (liquid at 800° C) with the highest mole percent silicon dioxide and you were restricted to only one other oxide in addition to silica, what additional material would you choose? Give an explation.**

I would use Na2O. Due to the miscibility gap, at 800 degrees C, I would form a phase that is over 95 % SiO2.

The two most important concepts I learned in this chapter:

1. Oxygen ratio in silicates
2. Miscibility gap in oxides