Self-Assessment: Amorphous Materials

Weekly Homework Quiz

(a) A melt of magnesium borate glass with the composition 20% MgO – 80% B_2O_3 is cooled at a rate of r_1. The glass transition temperature, T_g, is measured to be T_1. In order to raise the value of T_g to $T_2 > T_1$ while keeping the cooling rate equal to r_1, how should the MgO content of the glass be changed? Explain with reference to atomic structure.

(b) On a plot of molar volume, V_m, versus temperature, T, sketch cooling curves for a borate melt that solidifies to form (1) crystalline B_2O_3; and (2) amorphous B_2O_3. Indicate which material was cooled more quickly. No calculation necessary. Label the melting point of (1) and the glass transition temperature of (2). Indicate the excess molar volume, V^{xs}, and describe why it is a measure of atomic disorder.

3.091SC Introduction to Solid State Chemistry

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