Week 9

Amorphous structures I: Pair distribution function and glasses

Exercise 1

Answer these questions by true or false:

1. If order in a material is more pronounced, the correlation length will be longer
   True/false

2. Short-range order spans over a few atomic distances only
   True/false

3. Amorphous liquids melt over a range of temperatures
   True/false

4. A glass is always transparent
   True/false

Exercise 2:

Select the correct answer(s) (more than one answer can be correct)

1. The structure factor in scattering/diffraction…
   a. Describes the scattering of the interaction of all atoms in a unit cell in crystallography
   b. Describes the interaction between atoms in glasses
   c. Only exists for crystalline material

2. What happens if you add a network modifier to a silica glass?
   a. The correlation distance decreases
   b. The correlation distance remains the same
   c. The correlation distance increases
   d. The viscosity at the same temperature increases
   e. The glass transition temperature is unchanged

3. What happens if you add a network modifier to a borate glass?
   a. The correlation distance decreases
   b. The correlation distance remains the same
   c. The correlation distance increases
   d. The viscosity at the same temperature increases
   e. The glass transition temperature is unchanged

Exercise 3: Pair distribution function
Sketch a typical pair distribution function for

a) A gas
b) A crystalline material
c) A glass
d) Label the relevant points and axes (including units) in the PDF of a glass (c
e) How does the PDF in c) change if you heat or cool the material?

Exercise 4: Give two examples of application of amorphous materials, and describe the relevant property.

Exercise 5: What influences the glass transition temperature of amorphous materials?