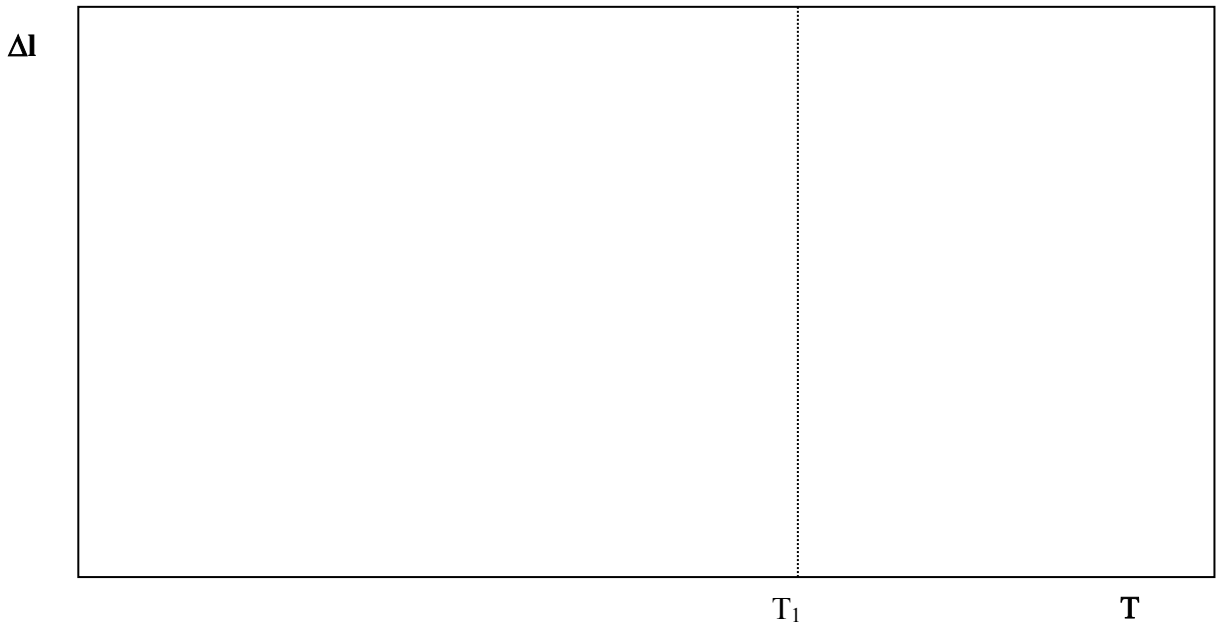
# Glass Engineering

## A.A. 2018-2019

## Homework n.1

1. A glass, at temperature $T_1$ possesses a viscosity of $10^8$ P. It is cooled initially at room temperature with a cooling rate of 1°C/min, and then heated at 10°C/min up to $T_1$ and immediately cooled at 10°C/min down to room temperature. Represent the thermal paths and specify the fictive temperatures.




2. Viscosity of the liquid phase and solidification process.

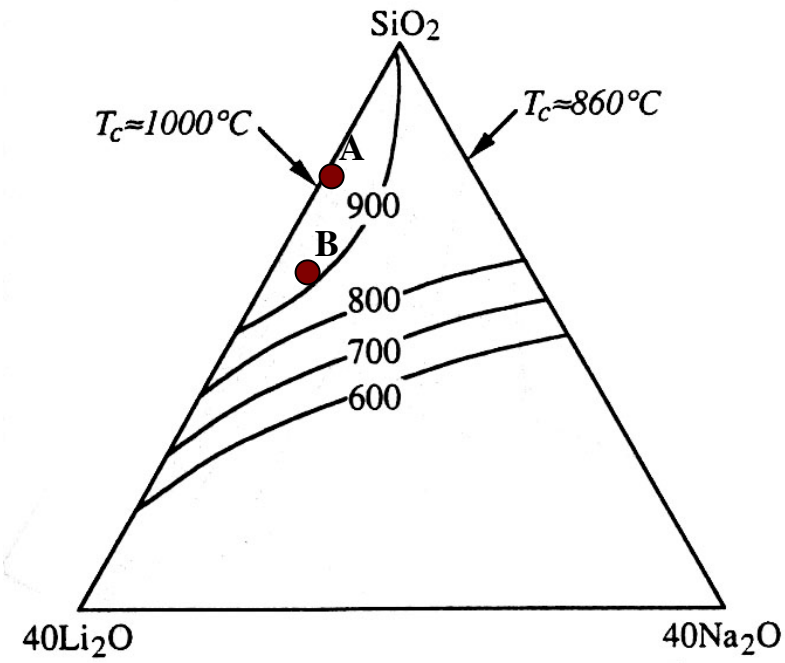
3. Determine the composition of the vitrifiable mix for producing (i) container amber glass, (ii) fiber glass and (iii) lead tableware glass (see composition table on the slides).

4. Raw materials as "formers" for the production of glass. Describe the nature, composition and function.

5. Melting accelerators.

6. What is the fining process?

7. The following immiscibility diagram is given. At composition A, what kind of structure is obtained for thermal treatment at 700°C? And at composition B?




8. By using elastic modulus measurement a glass transition temperature of 580°C was obtained. The Littleton softening point is 740°C. Estimate the viscosity trend as a function of temperature for the undercooled liquid.

9. How are the glass fibres for textiles produced?

10. The *float* process. Advantages and disadvantages.

11. Estimate the residual stresses in a glass sheet just after the float plant.

12. Compare the Maxwell (1) and Adams-Williamson (2) model for the stress reduction from 40 MPa to 2 MPa in a glass at T = 540°C if $T_g$=550°C, $\eta_T = 10^{11}$ Pa s, $G_T$ = 30 GPa, $A_a = 4.76 \times 10^{-4}$ 1/MPa s.