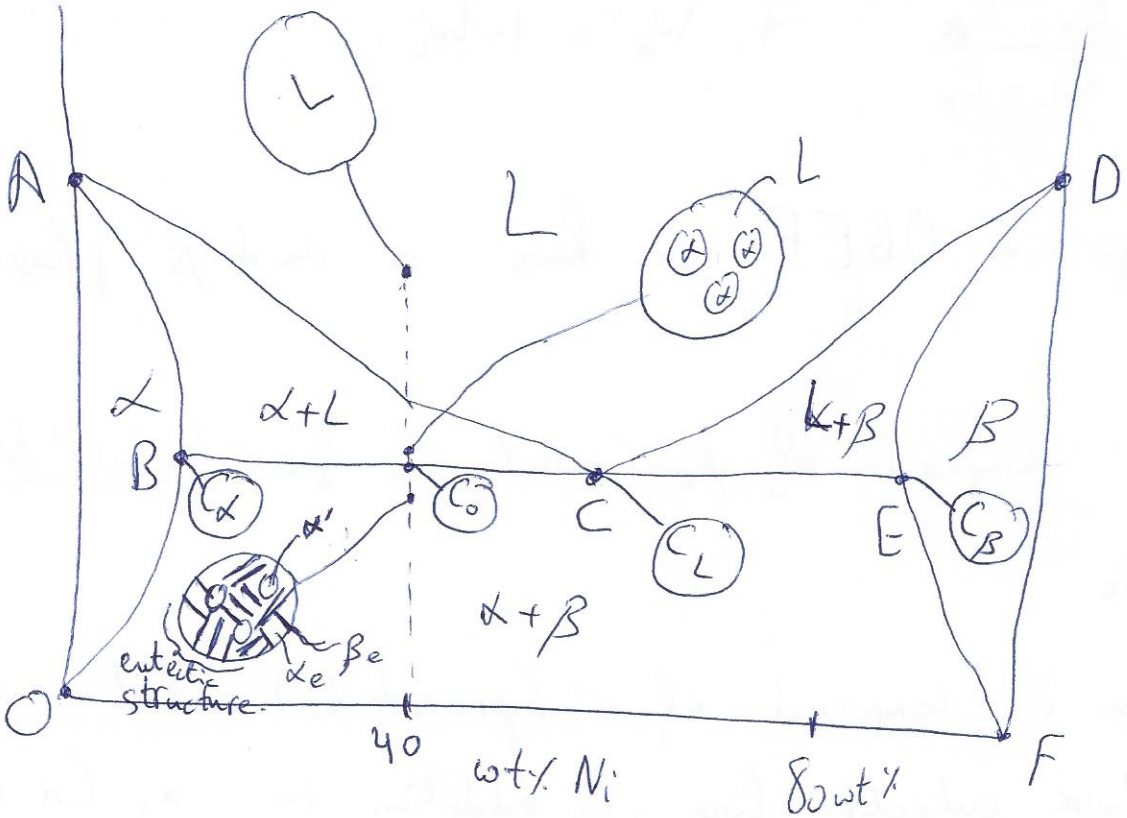

C: eutectic point & line $\overline{BE}$: eutectic line (eutectic temperature)

If we are cooling down an alloy of <u>40wt% Ni</u> from 1100°C till 700°C, the alloy will pass from Liquid phase region to <u>α+L</u> phase region to <u>α+β</u> phase region.

In this case L changes to α+L and then α grows further till the eutectic line. Afterwards (beneath the line) all the L will convert to eutectic structure (α_e and β_e).

$\therefore W_L = W_e = W_{\alpha e} + W_{\beta e}$

To calculate W_L, we use triangle ABC (as L phase is still found in this region but not in α+β region). Hence the the line is $\overline{BC}$ as L just above this line transform to ($\alpha_e + \beta_e$) just

below eutectic line.

$\therefore W_L = \frac{C_o - C_\alpha}{C_L - C_\alpha}$ & $W_{\alpha'} = 1 - W_L$.

Now in trapezoid OBEF we have α and β phases only.

β phase is composed of β_e (eutectic β) for 40 wt% Ni alloy.

- $W_{\beta_{total}} = W_{\beta_e}$

& α phase is composed of α' (proeutectic) which is α formed above eutectic line, in addition to α_e (α eutectic) formed due to L transformation to eutectic structure (α_e & β_e).

$\therefore W_{\alpha_{Total}} = W_{\alpha'} + W_{\alpha_e}$

- To calculate $W_{\alpha_{Total}}$ we take the complete eutectic line $\overline{BE}$

$\Rightarrow W_{\alpha_{Tot.}} = \frac{C_\beta - C_o}{C_\beta - C_\alpha}$.

* Note that for 80 wt% Ni alloy the proeutectic is β and:

$\therefore W_{\beta_{total}} = W_{\beta'} + W_{\beta_e}$

& $W_{\alpha\,total} = W_{\alpha_e}$

- The same principles apply for eutectoid diagrams but phases are different. For example, For Iron-Carbon phase diagram the proeutectoid can be either α or Fe_3C (depending on C_o: alloy composition) & γ (austenite) transforms to pearlite (eutectoid structure).