2.7 Liquid solid phase diagrams

As an example for liquid-solid phase diagrams we will only discuss one example of a eutectic phase diagram as shown in Fig. 2.10 a) and discuss properties along the isopleth a:

- a_1 to a_2: single phase melt
- a_2 to a_3: Precipitation of pure $B \rightarrow L$ becomes rich in A
- a_3: further increase of A in L, solid/liquid phase ratio is close to $1:1$
- a_4: the eutectic composition (e) of the liquid is reached, further cooling produces a characteristic lamellar micro-structure of pure A and B. Point e represents the composition with the lowest melting point, cf. "eutectic" (Greek: "easily melted").

Experiments for phase diagram determination: Heating or cooling as illustrated in Fig. 2.10 b) and c):

- Crystallization of B releases latent heat slope of cooling curve is reduced
- When reaching the eutectic line cooling stops by full crystallization of the sample
- Depending on the amount of material with composition e the plateau could be maintained distinct times. The longest duration occurs for a sample with composition e.

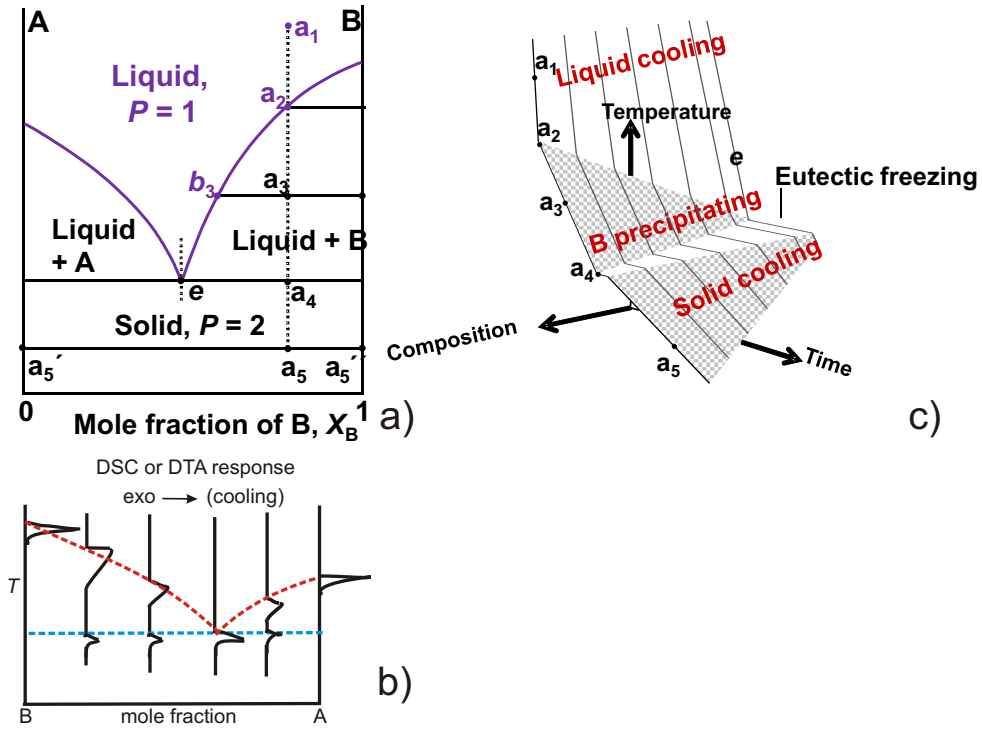

Figure 2.10: a) Examples of an eutectic phase diagram; b) DSC or DTA (differential thermal analysis) data showing heat energy vs. temperature (and thus the release of crystallization energy when melting a solid) c) 3D visualization of eutectic freezing.