1.10. Single compound layer: short conclusions

1. Solid-state growth of the layer of any chemical compound A_pB_q between two mutually insoluble elementary substances A and B is due to two parallel partial chemical reactions proceeding at its interfaces, each of which takes place in the two consecutive, continuously alternating steps:

(i) diffusion of atoms of a given component across the bulk of the layer,

(ii) chemical transformations with the participation of these atoms and the surface atoms of another component.

2. Both reactions as well as the diffusional fluxes of the components across the bulk of a growing compound layer are independent of each other.

3. The layer thickness-time kinetic dependence is in general described by a linear-parabolic equation. Its initial region is close to a straight line, while then there is a gradual transition to a parabola. The higher the temperature, the narrower is the region of linear growth.

4. There are two critical values, $x_{1/2}^{(A)}$ and $x_{1/2}^{(B)}$, of the layer thickness which divide this dependence into the reaction controlled and diffusion controlled regions with regard to components A and B, respectively.

5. For any chemical compound A_pB_q, the reaction-diffusion and self-diffusion coefficients of a given component (A or B) are in general different, the former being much greater than the latter. The difference in their values may reach several orders of magnitude. After normalising to the same vacancy concentration, these become at least close, if not identical, provided that the mechanism of diffusion is of vacancy type in both the growing and non-growing layer of that compound.

6. Different diffusional contributions of the components of a chemical compound to the growth process of its layer at the interface between phases A and B should not be regarded as a manifestation or result of the Kirkendall effect since the fact that these contributions are in general different became known far before discovering this effect, the essence of which consists in different diffusivities of the components of a substitutional solid solution.