2.10. Two compound layers: short conclusions

1. In the reaction controlled regime the layer of each of two chemical compounds A_pB_q and A_rB_s grows at the expense of two partial chemical reactions taking place at its interfaces with adjacent phases.
2. Each of two growing compound layers is a product in the two and a reactant in one of the four partial chemical reactions taking place in the A–A_pB_q–A_rB_s–B system.
3. In most reaction couples, the layer formed first should reach a certain minimal thickness before the second layer can occur. Both compound layers will then grow simultaneously until the full consumption of one of initial substances A or B.
4. In any binary system, the sequence of formation of compound layers is governed by the rate of chemical transformations (partial chemical reactions) at phase interfaces.
5. The layer thickness-time kinetic relationships are in general rather complicated, not merely parabolic. Depending on the values of the chemical and physical (diffusional) constants, their different portions can be described by linear, paralinear, asymptotic, parabolic and other laws.
6. In the diffusion controlled regime the growth of each of two compound layers is due to one partial chemical reaction taking place at its common interface with another growing layer. In this case, only the A atoms diffuse across the A_pB_q layer adjacent to initial phase A, while only the B atoms diffuse across the A_rB_s layer adjacent to initial phase B. No partial chemical reactions proceed at the A–A_pB_q and A_rB_s–B interfaces in view of the lack of appropriate diffusing atoms.
7. In the case of two compound layers, even growing under conditions of diffusion control, application of Matano's analysis and calculation of integrated diffusion coefficients do not seem to be sufficiently substantiated. Such quantities can hardly have any physical meaning.