5.6. Reaction-diffusion kinetics in solid-liquid and solid-gas systems: short conclusions

1. If the chemical compound is formed under conditions of simultaneous dissolution in the liquid phase or evaporation into the gaseous phase, then its layer does not occur at the *A–B* interface until the rate of dissolution or evaporation becomes equal to the sum of the rates of chemical transformations (chemical reactions as such) taking place at the layer interfaces with initial substances *A* and *B*.

2. If the rate of layer formation is limited by the rate of diffusion of the atoms of reacting substances across its bulk, it is impossible to fully prevent the occurrence of this layer between *A* and *B* by any reasonable increasing the dissolution or evaporation rate. What is only possible is a considerable reduction of its thickness.

3. If the chemical compound layer dissolves or evaporates under isothermal conditions at a constant rate, its thickness reaches with passing time a certain maximum value and then remains almost unchanged. Subsequently, the layer of constant (maximum) thickness moves as a whole into the bulk of phase *A* until this phase is consumed completely.

4. At a considerable solubility of solid *A* in liquid *B*, the formal search for the so-called layer-growth laws by means of mathematical treatment of the experimental data using linear, parabolic, logarithmic or other dependences does not seem to be reasonable. Each of the 'laws' thus obtained holds only under particular (in most cases, non-specified) dissolution conditions. It is therefore sufficient to slightly change those conditions, and the 'law' will also change. The same applies to the case of formation of the layer of a volatile chemical compound.

5. At finite values of the surface area of a solid and the volume of a liquid, the dissolution rate of the solid in the liquid phase decreases with passing time from its maximum value to zero (when the saturation concentration is reached). The greater the surface area of the solid and the lesser the volume of the liquid, the quicker the saturation of the liquid by the dissolving substance is attained. With increasing degree of saturation, the influence of dissolution on the growth kinetics of a chemical compound layer gradually weakens and hence the layer thickness-time dependence asymptotically approaches that which would be observed in the case of a saturated solution of *A* in *B*.