World Academy of Science, Engineering and Technology
International Journal of Physical and Mathematical Sciences
Vol:8, No:06, 2014

Formation of Chemical Compound Layer at the Interface of Initial Substances A and B with Dominance of Diffusion of the A Atoms

Authors : Pavlo Selyshchev, Samuel Akintunde

Abstract : A theoretical approach to consider formation of chemical compound layer at the interface between initial substances A and B due to the interfacial interaction and diffusion is developed. It is considered situation when speed of interfacial interaction is large enough and diffusion of A-atoms through AB-layer is much more then diffusion of B-atoms. Atoms from A-layer diffuse toward B-atoms and form AB-atoms on the surface of B-layer. B-atoms are assumed to be immobile. The growth kinetics of the AB-layer is described by two differential equations with non-linear coupling, producing a good fit to the experimental data. It is shown that growth of the thickness of the AB-layer determines by dependence of chemical reaction rate on reactants concentration. In special case the thickness of the AB-layer can grow linearly or parabolically depending on that which of processes (interaction or the diffusion) controls the growth. The thickness of AB-layer as function of time is obtained. The moment of time (transition point) at which the linear growth are changed by parabolic is found.

Keywords : phase formation, binary systems, interfacial reaction, diffusion, compound layers, growth kinetics
Conference Title : ICP 2014 : International Conference on Physics
Conference Location : Toronto, Canada
Conference Dates : June 16-17, 2014