Preface

The fascinating development of materials science which nowadays definitely involves the previously side-lined basic research within physics and chemistry has led to a number of innovative technologies of new materials. Despite many hopes and even successes in replacing traditional metallic materials by, for example, polymers or composites, the former materials are not only still widely used but are also making a ‘come back’. As an example, intermetallic phases are enjoying an ever increasing interest as either functional or high-temperature structural materials and are prominent in this development.

The present volume responds to the above trends by presenting a series of 7 extended articles devoted to diverse aspects of diffusion in intermetallic phases studied both experimentally and theoretically. The opening chapter gives an overview on the subject matter and focuses on binary intermetallics. It is followed by two works presenting results obtained by means of two particular promising experimental methods that allow the observation of diffusion phenomena in terms of individual acts of atomic migration. Diffusion in nanostructured intermetallic materials is addressed in the following two contributions which discuss a hot topic of diffusion-controlled solid-state reactions including self-propagating high-temperature synthesis (SHS). Elucidation and interpretation of the experimental results is proposed in terms of analytical calculations, as well as of atomistic simulations. The final two chapters of the volume are devoted to two particular diffusion-controlled phenomena observed in Ni-Al – an intermetallic recently being of both technological and basic interest. The first of these presents a thorough theoretical study of therмотransport in liquid NiAl while the closing chapter reports on an atomistic simulation study of ordering phenomena in NiAl that is fundamentally controlled by vacancy thermodynamics.

R. Kozubski,
M. Smoluchowski Institute of Physics
Jagiellonian University in Krakow
Reymonta 4
30-059 Krakow
Poland