Preface

To quote the words in 1984 of the late David Lazarus, “It is perhaps in the nature of the beast that the elementary diffusion process is so very fundamental and ubiquitous in the art and science of dealing with matter in its condensed phase that it never ceases to be useful but, at the same time, is a problem which is never really solved. It remains important by any measure.“ Indeed, there are few properties of condensed matter that do not depend directly or indirectly on diffusion, either of matter or of heat. And despite an immense amount of research extending well over a century on all aspects of diffusion there is apparently much more to be learnt about this mysterious beast. This volume is the opening volume of Diffusion Foundations, a new periodical that is in the form of a series of books of invited contributions covering recent advances in mass and heat diffusion in solids and liquids. The intention of Diffusion Foundations is to provide a place where extended papers on any aspect of diffusion can be published.

In the first chapter Prof. Kozubski and colleagues present atomistic simulations of superstructure transformations of intermetallic nanolayers. In Chapter 2, Prof. Danielewski and colleagues discuss a formalism for the morphology of the diffusion zone in ternary alloys. In Chapter 3, Professors Sprengel and Koiwa discuss the classical contributions of Boltzmann and Matano for the analysis of concentration-dependent diffusion. This is followed by Chapter 4 by Professor Cserháti and colleagues on the use of Kirkendall porosity for fabricating hollow hemispheres. In Chapter 5, Professor Morton-Blake reports on molecular dynamics calculations of ions in a synthetic channel. In Chapter 6, Professor Bokstein and Dr Rodin review grain boundary diffusion and segregation in metals and alloys. This is followed by a review by Professor Mehrer on diffusion in glassy metals (Chapter 7). In Chapter 8 Professor Prochazka and colleagues report on defects and sintering in yttria-stabilized zirconia using positron annihilation spectroscopy and in Chapter 9 Professor Fishman[†] and colleagues report on mechanical activation of Mn-O oxides. Finally in Chapter 10 Professors Popova and Popov analyse the role of diffusion in the structure and texture of Cu-Nb composites. We wish to thank the authors for their prompt contributions and the reviewers for their efforts. We also wish to thank Mr Thomas Wohlbier (President of TTP) for his encouragement in the development of the concept of Diffusion Foundations and the appearance of this first volume.

Professors Graeme Murch, Andreas Öchsner and Irina Belova (Editors)

March 2014