

Preface

What the book is about

This book describes transport through complex, heterogeneous media. There are large coupling effects between transports of heat, mass, charge and chemical reactions in such media, and it is important to know how one should properly integrate across heterogeneous systems where different phases are in contact. Transports perpendicular to planar interfaces are treated.

How we were inspired to write it

Waldmann [1] was the first to point out that an analysis of boundary conditions should be incorporated in the framework of non-equilibrium thermodynamics. He did not include excess densities to describe the properties of the surface, however. In the 1970s and 1980s Bedeaux, Albano and Mazur [2–4] extended his work and laid the theoretical foundation for the description of non-equilibrium processes, including a full description of the thermodynamic properties of the surface. The work of Bedeaux, Albano and Mazur addressed not only transports into and through a surface, but also transports along surfaces as well as the motion of the surface itself. Their methods were inspired by concurrent work on the optical properties of surfaces by Bedeaux and Vlieger [5, 6], using generalized functions for the description of surface properties. The present work takes advantage of these methodologies.

Who it is meant for

The purpose of this book is to encourage the use of non-equilibrium thermodynamics to describe transport in complex, heterogeneous media. The book is written for a graduate level course for physicists, physical chemists, chemical or mechanical engineers. The book requires knowledge of basic thermodynamics corresponding to that given by Atkins, Physical

Chemistry (Oxford University Press), or Moran and Shapiro, Fundamentals of Engineering Thermodynamics (John Wiley & Sons).

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