

PREFACE

The principal aim of this book is to provide a tool for discussing various phenomena at biointerfaces such as the surface of cells on the basis of biophysical chemistry. For nonbiological interfaces, colloid and interface science, one of the major branches of physical chemistry, forms a powerful basis for understanding various interfacial phenomena. The Derjaguin–Landau–Verwey–Overbeek (DLVO) theory explains well the stability of colloidal suspensions in terms of the electrostatic and van der Waals interactions between the particles. The behavior of colloidal particles in an applied electric field is analyzed by electrophoresis theories of Smoluchowski, Hückel, and Henry. The charge or potential of the particle surface plays an essential role in the above-mentioned phenomena. It must be noted here that the particle-fixed charges are assumed to be located only at the particle surface (of zero thickness). This model, however, is by no means a good approximation for biocolloids such as biological cells. For such particles, fixed charges are distributed over some depth on the particle surface, or the particle surface is covered with a polyelectrolyte layer. We call polyelectrolyte-coated particles soft particles. In this book, we discuss various phenomena at biointerfaces, that is, potential and charge at interfaces, electrokinetic phenomena at interfaces, and interactions between surfaces, on the basis of the soft particle model. We will see that the Donnan potential as well as the surface potential is an important factor controlling electric properties of soft particles or soft surfaces.

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