Applied Colloid and Surface Chemistry

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John Wiley & Sons, Ltd
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Those that can, teach

Sit down before fact as a little child, be prepared to give up every preconceived notion, follow humbly wherever and to whatever abysses nature leads, or you shall learn nothing.

*Thomas Henry Huxley (1860)*
Contents

Preface xi

1 Introduction 1
   Introduction to the nature of colloidal solutions 1
   The forces involved in colloidal stability 4
   Types of colloidal systems 5
   The link between colloids and surfaces 6
   Wetting properties and their industrial importance 8
   Recommended resource books 10
   Appendices 11

2 Surface Tension and Wetting 13
   The equivalence of the force and energy description of surface tension and surface energy 13
   Derivation of the Laplace pressure equation 15
   Methods for determining the surface tension of liquids 17
   Capillary rise and the free energy analysis 21
   The Kelvin equation 24
   The surface energy and cohesion of solids 27
   The contact angle 28
   Industrial Report: Photographic-quality printing 33
   Sample problems 35
   Experiment 2.1: Rod in free surface (RIFS) method for the measurement of the surface tension of liquids 37
   Experiment 2.2: Contact angle measurements 42

3 Thermodynamics of Adsorption 47
   Basic surface thermodynamics 47
   Derivation of the Gibbs adsorption isotherm 49
   Determination of surfactant adsorption densities 52
Industrial Report: Soil microstructure, permeability and interparticle forces 54
Sample problems 55
Experiment 3.1: Adsorption of acetic acid on to activated charcoal 56

4 Surfactants and Self-assembly 61
Introduction to surfactants 61
Common properties of surfactant solutions 63
Thermodynamics of surfactant self-assembly 65
Self-assembled surfactant structures 68
Surfactants and detergency 70
Industrial Report: Colloid science in detergency 74
Sample problems 75
Experiment 4.1: Determination of micelle ionization 75

5 Emulsions and Microemulsions 79
The conditions required to form emulsions and microemulsions 79
Emulsion polymerization and the production of latex paints 81
Photographic emulsions 84
Emulsions in food science 85
Industrial Report: Colloid science in foods 85
Experiment 5.1: Determination of the phase behaviour of microemulsions 87
Experiment 5.2: Determination of the phase behaviour of concentrated surfactant solutions 90

6 Charged Colloids 93
The formation of charged colloids in water 93
The theory of the diffuse electrical double-layer 94
The Debye length 99
The surface charge density 101
The zeta potential 102
The Hückel equation 103
The Smoluchowski equation 106
Corrections to the Smoluchowski equation 108
The zeta potential and flocculation 110
The interaction between double-layers 112
The Derjaguin approximation 116
Industrial Report: The use of emulsions in coatings 117
Sample problems 119
Experiment 6.1: Zeta potential measurements at the silica/water interface 120

7 Van der Waals forces and Colloid Stability 127
Historical development of van der Waals forces and the Lennard-Jones potential 127
This book was written following several years of teaching this material to third-year undergraduate and honours students in the Department of Chemistry at the Australian National University in Canberra, Australia. Science students are increasingly interested in the application of their studies to the real world and colloid and surface chemistry is an area that offers many opportunities to apply learned understanding to everyday and industrial examples. There is a lack of resource materials with this focus and so we have produced the first edition of this book. The book is intended to take chemistry or physics students with no background in the area, to the level where they are able to understand many natural phenomena and industrial processes, and are able to consider potential areas of new research. Colloid and surface chemistry spans the very practical to the very theoretical, and less mathematical students may wish to skip some of the more involved derivations. However, they should be able to do this and still maintain a good basic understanding of the fundamental principles involved. It should be remembered that a thorough knowledge of theory can act as a barrier to progress, through the inhibition of further investigation. Students asking ignorant but intelligent questions can often stimulate valuable new research areas.

The book contains some recommended experiments which we have found work well and stimulate students to consider both the fundamental theory and industrial applications. Sample questions have also been included in some sections, with detailed answers available on our web site.

Although the text has been primarily aimed at students, researchers in cognate areas may also find some of the topics stimulating. A reasonable background in chemistry or physics is all that is required.
Introduction to the nature of colloids and the linkage between colloids and surface properties. The importance of size and surface area. Introduction to wetting and the industrial importance of surface modifications.

Introduction to the nature of colloidal solutions

The difference between macroscopic and microscopic objects is clear from everyday experience. For example, a glass marble will sink rapidly in water; however, if we grind it into sub-micron-sized particles, these will float or disperse freely in water, producing a visibly cloudy ‘solution’, which can remain stable for hours or days. In this process we have, in fact, produced a ‘colloidal’ dispersion or solution. This dispersion of one (finely divided or microscopic) phase in another is quite different from the molecular mixtures or ‘true’ solutions formed when we dissolve ethanol or common salt in water. Microscopic particles of one phase dispersed in another are generally called colloidal solutions or dispersions. Both nature and industry have found many uses for this type of solution. We will see later that the properties of colloidal solu-