

## Physical Chemistry of Textile Materials

Kolloidchemische Grundlagen der Textilveredlung

Von Dr. Emmerich Valkó. Pp. xi + 701. (Berlin: Julius Springer, 1937.) 60 gold marks.

IN this book, Dr. Valkó gives a remarkably comprehensive account of the present position of physico-chemical investigation in relation to many aspects of the manufacture of textile materials. The title is perhaps not altogether fortunate, since the scope of the book is wider than it suggests. Moreover, the author is well aware that modifications of the physical characteristics of the various textile fibres are *fundamentally* determined by the chemical nature of the substances composing them, and he also recognizes that nothing is gained by simply labelling obscurities in behaviour as 'colloidal phenomena'.

The first chapter consists of a very useful description of the chemical constitution and molecular and crystalline structure of cellulose, wool keratin and silk fibroin. It includes an able critical review of the results obtained from attempts to estimate the chain-length of cellulose molecules. In Chapter iii an interesting account is given of the arrangement of the molecules in cotton, wool and other fibres, as deduced from their optical and mechanical properties, and from their behaviour in the diffraction of X-rays, the absorption of liquids and in other respects. Evidence for the existence of structural units in the form of sub-microscopic molecular aggregates ('micelles' or, more specifically, 'crystallites') is presented in a judicious fashion. In particular, it is emphasized that optical and mechanical anisotropy of the fibre cannot be regarded as direct proof of the presence of crystallites. Chapter iv deals with the sorption of water by the fibres, and the consequent alteration in their dimensions and mechanical properties. The nature of the sorption process is fully discussed in the light of the available information, due weight being given to the data obtained in studies of the heat of sorption, sorption hysteresis, and the specific volume of the fibres.

Chapter v is devoted to the consideration of the chemical and physical behaviour of wool and silk when treated with solutions of acids and bases, and Chapter vii deals with various aspects of the mercerization of cotton. While clearly explaining how the principles of the Donnan membrane equilibrium may be operative in the swelling of wool, silk and cellulose, the author is careful to indicate the limitations of the osmotic theory. In reviewing work on the absorption of alkali by cellulose, Dr. Valkó appears to have overlooked

an investigation by Hibbert and co-workers (1930), which provides further evidence in favour of chemical combination in equal stoichiometric proportions. The 'degeneration' and 'activation' of cellulose, and the modification of wool by the action of chlorine and other reagents, are considered at length in Chapters viii and ix. Short chapters on the morphology and histology of fibres, the electrokinetic behaviour of cellulose, and the 'felting' of wool, complete the first half of the book.

The next three chapters, which occupy about a third of the book, deal with the nature of aqueous dispersions of dyes, the principles underlying dyeing processes, and the behaviour of dyes when fixed on the fibres. They form a particularly valuable feature of the book, since the need for a summary of this kind has long existed. It is frequently supposed that in the direct dyeing of cotton, the dye is held in virtue of its colloidal condition. Dr. Valkó shows that, while this view is not supported by the results of recent work with purified dyes, there is reason for postulating an *indirect* connexion between the colloidal character of the dyes and their dyeing properties, in the sense that the forces which produce association of the dye molecules in solution are also responsible for their attachment to the fibre.

An excellent account is given, in Chapter xiv, of the properties (including surface tension) of solutions of 'soaps', using this term in its widest sense. Recent developments in this field are described in detail, since they are of special interest in regard to the elucidation of the state of the soap at the concentrations employed in textile practice. In the following chapter, interfacial phenomena, and the stabilization of emulsions and suspensions, are discussed in connexion with the wetting, washing and impregnation of the fibres. The greater part of the remaining chapter is allotted to the physical chemistry of starch solutions, there being, in addition, short sections on gum arabic, methyl cellulose, and the processes of sizing and printing.

The author designedly excludes consideration of purely mechanical processes and processes involved in the actual formation of artificial fibres. Within the limits imposed, however, little of importance appears to have escaped mention. Certainly full justice is done to the work of British investigators.

The book should facilitate collaboration between specialists in the industries concerned, and prove stimulating to all interested in colloid chemistry. Though packed with information, it is very readable, as Dr. Valkó maintains a lucid and agreeable style throughout. The diagrams are very numerous and the book is well produced. T. R. BOLAM.