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Synthetic Dyes

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I. INTRODUCTION

Synthetic dyes are mainly derivatives of aromatic hydrocarbons for which the chief source is coal tar. The term "synthetic dyes" has therefore been regarded in common usage as being synonymous with coal tar dyes. This is no longer strictly true, however, because the aromatic hydrocarbons are being manufactured in increasingly large quantities from petroleum.

A. Classification, Applications, and Colors

Dyes may be classified according to either their chemical constitution or their application to textile fibers and for other coloring purposes. To some extent there is common ground between the two methods of classification, because certain groups of dyes, such as sulfur colors must be applied by methods that depend on their chemical character. Further, the dyeing properties are useful for subdividing a large group of dyes such as the azo or anthraquinone dyes. Thus, the basic classification "anthraquinonoid dyes" indicates the fundamental nucleus from which all the dyes in the series are derived, but for detailed consideration it is convenient to divide the group into cellulose acetate, mordant, acid, and vat dyes.

The dyes are also classified according to the chromophores or essential color-producing groups that are present, but color–constitution relationships are now known to be extremely complex, and for a systematic treatment of the chemistry of dyes a classification based primarily on characteristic structural units is more satisfactory. The azo group, the anthraquinone nucleus, and heterocyclic ring systems (e.g., pyrazolone, thiazole, acridine, thiazine, oxazine) are examples of structural units that provide a simple basis of division and subdivision. Methods of preparation and application are also useful for classification. Although the nitro group occurs in numerous dyes, the class name "nitro dyes" is restricted to the nitrophenols and the nitroarylamines, in which the nitro group is a vital factor in the production of color and dyeing properties. Dyes that do not justify treatment in separate chemical classes on account of their limited numbers and indefinite constitution have been classified as "miscellaneous dyes." For detailed classification, Venkataraman's text on synthetic dyes should be consulted (1).

Dyes are used for a wide variety of purposes, but their application to textile, foods, and leather is most important. The color of the dye depends on a number of factors. For example, with the azo group as the characteristic chromophore, the possible variations that influence the color and dyeing properties are (a) the number and position of the azo groups, (b) the nature of the aromatic nuclei, and (c) the end number and position of the sulfonic groups. It is obvious that various combinations of these factors can be used to obtain a given effect and that the color of the dye will ultimately depend on the constitution of the molecule as a whole.