A colour boom: the di- and tri-aryl methane dyes

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Abstract

The lecture will concentrate on the di- and tri-aryl methane dyes. These dyes produce brilliant hues, the range covered including yellows, reds, violets, blues and greens. During the second half of the 19th century they played an important role for dyeing textiles and other applications. The history of these dye classes is studied by the original historical sources, included the patent literature.

The tri-aryl methane dyes can be divided in two main groups, the Rosaniline and Malachite series. The start of the first group was the discovery of the red-violet dye fuchsine, some months after mauve, and turned out to be more useful. Some later it became clear that fuchsine was not only a dye but also a key intermediate for other dyes of this series. In the beginning of the 1860s the number of this group was increasing, especially violet dyes, like Regina purple (1860), methyl violet (1861) and Hofmann's violet (1863). In 1862 Nicholson found out that the basic dye aniline blue (Lyon blue) (1861), when treated with concentrated sulfuric acid, was converted into the soluble acid dye alkali blue (Nicholson blue). This discovery led to the preparation of a number of other sulfonated blue acid dyes, such as methyl blue, water blue, cotton blue, navy blue and soluble blue.

Subsequently, at the end of the 1870s the Malachite green series was discovered. The older members of this group are Malachite green (1877), brilliant green (1879) and Victoria green 3B (1883). Sulphonation of this series resulted in the green dyes, like Helvetia green (1878) and light green (1879). It was not until 1888 that sulfonated blue members, the Patent blues, were prepared.

The yellow colours are represented by the di-aryl methane dyes, known as the Auramines. They were discovered by Kern (Swiss firm Bindschedler & Busch) and Caro (German firm BASF) in 1883. This cooperation was so successful that in the same year violets, like crystal violet and ethyl violet, and blues, such as Victoria blue and night blue, were invented.

The di- and tri-aryl methane dyes possess poor light-fastnesses. Lehne writes that: 'after five days of light exposure the colours are much paler and in eighteen days the colours have been very strongly or almost completely faded'.

The analysis of the di- and most of the tri-aryl methanes can be done by means of HPLC-PDA using a gradient of water, methanol and phosphoric acid, the same system used for the analysis of natural dyes.

The history, the chemical constitution and the production of the most important dyes of these chemical dye classes will be discussed. In addition, dyeing recipes and the identification of di- and tri-aryl methane dyes on different art-objects, such as robes, embroideries, umbrellas, wallpaper and furniture, will be presented.

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