

The early synthetic organic dyestuffs: The Yellows

Matthijs de Keijzer and Maarten R. van Bommel

Netherlands Institute for Cultural Heritage, Research Department P.O. Box 76709, NL-1070 KA, Amsterdam, The Netherlands M.de.Keijzer@cultureelerfgoed.nl, M.van.Bommel@cultureelerfgoed.nl

Regina Hofmann-de Keijzer, University of Applied Arts Vienna, ARTEC / Archaeometry Salzgries 14/1, A-1013 Vienna, Austria, Regina.Hofmann@uni-ak.ac.at

Abstract

In 2002 we started a project focussed on a selection of 65 well-known synthetic organics, covering all dye-classes from the period 1850-1900. The research project has two main aims. First: to collect historical information by studying the original historical literature sources, including the patent literature. Secondly: to evaluate present techniques and to develop new analytical methods for the identification of these dyes. The second part of the project is carried out in collaboration with the Royal Institute for Cultural Heritage (KIK/IRPA).

This lecture will focus on the important synthetic organic yellow dyes. Our selection of 65 synthetics contains eleven yellows and they can be divided mainly in two groups: the nitro dyes and the azo-dyes. The nitro dyes belong to the first known synthetic organic group, characterised by the presence of nitro (-NO₂) groups. Nitro dyes are not very common and the shade range is limited to brown, yellow, orange and green. Nitro dyes are prepared by the treatment of on especially phenols and naphthols by nitric acid.

The second group are the azo dyes, which are characterised by the presence of the -N=N- bond. In 1858 Johann Peter Griess discovered the diazo-reaction, which can be used for preparing acid dyes. These dyes are produced by coupling a diazonium salt with an activated aromatic molecule. Three yellow synthetics belong to other chemical groups. Auramine is a di-aryl methane dye, quinoline yellow is a quinophthalone colouring matter and fluorescein belongs to the chemical group of the hydroxy-phthaleins.

The yellow dyes on textiles show different light-fastnesses. The nitro dyes, picric acid, Martius yellow and Naphthol yellow S, have a poor light-fastness. They are strongly fading within several days and nearly completely faded in several weeks. The yellow azo-dyes discovered in the 1880s, such as metanil yellow, tartrazine yellow and brilliant yellow, show a much better light-fastness. So research, especially done by German dye factories, produced newer and better yellow synthetics with an increasing light-fastness.

The history, the chemical constitution, the production and the names of the different dyestuffs will be presented. Additionally the identification of these dyes will be demonstrated by international case-studies on textile objects.

Name	C.I. Name	C.I. Number	Dye class	Discoverer(s)	Year of Discovery
Picric acid	Acid dye	10305	Nitro	P. Woulfe	1771
Martius yellow	Acid Yellow 24	10315	Nitro	R. Ganahl C.A. Martius	1856 1864
Fluorescein	Acid Yellow 73	45350	Hydroxy-phthalein	A. Baeyer	1871
Naphthol yellow S	Acid Yellow 2	10316	Nitro	H. Caro	1879
Metanil yellow	Acid Yellow 36	13065	Azo	C. Rumpff Hepp	1879 1882
Quinoline yellow	Acid Yellow 3	47005	Quino-phthalone	E. Jacobsen	1882
Auramine	Basic Yellow 2	41005	Di-aryl methane	A. Kern and H. Caro	1883
Tartrazine yellow	Acid Yellow 23	19140	Azo	H. Ziegler	1884
Brilliant yellow	Direct Yellow 4	24890	Azo	F. Bender	1886
Alizarine yellow GG	Mordant Yellow 1	14025	Azo	R. Nietzki	1887
Flavazin L	Acid Yellow 11	18820	Azo	C. Möllenhoff	1892

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