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IDENTIFICATION OF DYESTUFFS IN I.G.

BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE

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IDENTIFICATION OF DYESTUFFS IN I.G.

This subject was discussed at Leverkusen with Dr. Thomae who is one of I.G.'s most experienced operators in this field with special reference to vat dyestuffs since he is responsible for all the testing arising from their "Indanthrene House" scheme.

The colour reactions and technique are for the most part generally known and it was stressed that success in this matter is essentially a matter of experience. Each system as far as it can be generally set out has defects.

In the I.G. system water soluble dyestuffs are identified in powder form or in solution; dyeings must be previously extracted.

The insoluble textile dyestuffs, vat dyestuffs, etc., are identified on the fibre; dyestuff powders are, therefore, dyed or printed first.

For the Determination of Single Dyestuffs (see the following are necessary:-

(1) Reaction tables. These include the fundamental reactions, i.e., a number of colour reactions, which are given in a similar manner by each dyestuff. The fundamental reactions of water soluble dyestuffs are naturally different from, for instance, vat dyestuffs. Identically or similarly reacting dyestuffs must be further differentiated by additional reactions.

(2) Authentic standards. Powder samples in the case of water soluble dyestuffs and dyeings in the case of vat dyestuffs, Naphthols, etc.

Mixtures where necessary, are identified spectroscopically or are separated by chromatographic absorbtion analysis (see Ruggli & Jensen Helv. Chem. Acta XVIII 8. 624).

The detailed scheme, as far as is possible, is set out below.

ROUGH GROUP-SEPARATION OF DYESTUFF IN SUBSTANCE

Heat.

Organic dyestuffs - char - or possibly sublime (Indigo-para red)

Inorganic dyestuffs - do not char.

H_2SO_4 Conc.

Inorganic dyestuffs - mostly insoluble, or possibly colourless solution.

Organic dyestuffs - mostly coloured solution (Naphthol AS mostly very strongly coloured sulphur dyestuff mostly slightly soluble and dull).

Solubility experiments.

Sprayed on wet filter paper, heat with water and pour on to filter paper. The same with alcohol.

Mostly water soluble - basic also in alcohol Reactions with the sprayed-out dyestuff	Mostly insoluble in water and alcohol.	Insoluble
On filter paper H_2O 10% H_2SO_4 6° NaOH. NH_3 then heat.		
Mostly changes colour with one or other reaction solubility increases.	Mostly fairly unaffected.	Insoluble

Dyeing on wool, tanned cotton & cotton — NaOH 6° + Hydrosulphite

Wool dyed, possibly also cotton slightly, possibly tanned cotton dyed.	Tanned cotton dyed, possibly also wool dyed.	Cotton dyed, & possibly wool dyed.	Vats mmstly weak & dull, most yellowish or brownish coloured. (oxydisable)	Vats mostly much stronger deep yellow

Dyestuff base extracted with ether.

Treat with NaOH, Ether filtered. — Base + ether shaken up. Ether + Acetic acid.

Colourless	Dyed			
Group of the Acid dyestuffs.	Group of the Basic dyestuffs.	Group of the Direct Cotton dyestuffs.	Group of the sulphur dyestuffs	Group of the Vat dyestuffs
			Make dyeings. Further tests follow on the fibre.	Make dyeings.

GENERAL GROUP SEPARATION FOR DYESTUFFS ON THE FIBRE

	1. The dyestuffs are dissolved by extraction with solvent (a) H_2O (b) Alcohol (c) Glacial acetic acid (d) NH_3 + H_2O (e) NH_3 + H_2O + alcohol	2. Extract from 1, evaporated, and (if not precipitated by H_2O) dyed on wool, tanned cotton & cotton.	3.	4. Treat fibres with cold stannous chloride (see over)	5. Stannous chloride solution warmed with lead acetate paper to test for H_2S	6. Vatting & Oxidation NaOH and Hydrosulphite	7. then Oxidise	8. Pyridine
I. Acid dyestuffs	+	Wool dyed, possibly also cotton, but less possibly tanned cotton	NaOH + Ether No colour-base					
II. Basic dyestuffs	+ +	Tanned cotton, possibly also wool	NaOH + Ether Isolates colour base.					
III. Direct Not developed e.g. Sirius	+	Cotton dyed, and possibly wool.						
developed e.g. Primulin chiefly in e	+ (+)							
V. Mordant dyestuffs	+ + Dyestuff often decomposed by extraction with acetic acid.	Possibly wool, occasionally tanned cotton, not cotton.	HCl 20° = dissolve NaOH 6° = dissolve Mostly metal test. Individual reactions.					
VI. Indocarbon CL dyestuffs	+			Fibres soon yellowish (Oxidisable)	Rather strong.	Yellowish.	Colour returns	
VII. Hydron Blue dyestuffs	+			"	Clear	"	"	
VIII. Sulphur dyestuffs, blue, green, grey, violet, olive black.	Sometimes in extraction and dyeing similar to basic and direct dyestuffs (But weaker).			"	Rather strong	Mostly yellowish	"	
IX. Sulphur dyestuffs, yellow, orange brown.	"	"		Mostly little change.	"	Mostly yellowish, brownish yellow.	"	
X. Oxidation dyestuffs, aniline black, Diphenyl black, Paramine, Furkamine.	+	Precipitates, but possibly contains basic by-products.		Fibres hardly altered.		Dull yellowish	"	Insoluble
XI. Vat dyestuffs (indigosols)	+	Precipitate		Not destroyed.	Some weakly positive.	Rapid change in colour of the fibre (Vats)	"	Soluble
XII. Naphthol AS (Rapid Fast Rapidogen, Rapidazol)	+	Precipitate		Hardly changed		Fibres slowly go yellowish Very stable fibres fluorescent with U.V. lamp.	Does not return	Very soluble
XIII. Ice Colours, Para red and other, B naphthol combinations.	+	Precipitate		"		Fibres almost colourless. Fibres not fluorescent with U.V.	"	"

Stannous chloride Solution:

1 Part $SnCl_2$

1 Part Conc. HCl

1 Part Water.

Ammonia:

25% Aqueous ammonia

d = 0.910

SINGLE DYESTUFF IDENTIFICATION FOR ACID, BASIC & DIRECT DYESTUFFS

SYSTEM FOR THE REACTION TABLES (FOR ALL THREE DYESTUFF GROUPS)

FUNDAMENTAL REACTIONS

Examples	H_2SO_4 Conc.	Diluted with water.	Sprayed on to moistened filter paper, or solution poured on filter paper. + H_2SO_4 10% solution.	+ NaOH 4%	+ NH_3 25%	Reduction zinc dust and ammonia Pour out on filter paper.	+ 10% H_2SO_4
Direct Deep Black E Extra.	Violet blue.	Violet black.	Violet	Blue green	Blue green	Violet blue	Greenish blue
Lirect Deep Black RW	"	"	"	"	"	"	"
Artificial Silk Black G.	Blue green	"	"	"	"	"	"
Diamine Black BH	Blue	Reddish violet	"	Somewhat redder	Trace redder	Red Brown	Dull violet

ADDITIONAL REACTIONS

in the general Reactions as they are used for Vat dyestuffs and Naphthol AS series.

SEPARATION REACTIONS

chiefly chromatographic absorptionanalysis.

SINGLE DYESTUFF IDENTIFICATION FOR THE VAT DYESTUFFS

SCHEME OF FUNDAMENTAL REACTIONS

	Concentrated H_2SO_4	Nitric Acid Spot: Fibre and HNO_3	Nitric Acid Spot: Spot on filter paper	Nitric Acid Spot: Spot on filter paper and $SnCl_2$	Fibre in $SnCl_2$ Solution	$NaOH$ & Hydrosulphite: Fibre	$NaOH$ & Hydrosulphite: Solution	Acidified Vat
Examples:								
Ind. Yellow GK	Yellow					Dull reddish violet (very soluble)		Yellow
" " 5GK	"					"	"	"
Algol Yellow GC	Lemon		Lemon	Red	Red	Violet	Violet	Red
Ind. Golden Yellow GK	Red-violet					Red	Red	Yellow
" " " RK	Violet					Violet red	Violet red	Yellow
" Red FBB	Almost colourless					Olive	Greenish violet (red)	Violet red
" " RK	Yellow brown	Rather yellower	Rather yellower	Rather redder		Violet	Violet	Orange red
" Brill. Pink R Extra	Fibre red, Solution green					Lemon	Lemon	Colourless
" Scarlet B	Green					"	"	"
" Brill. Violet RR	Blue green					Blue	Blue	Red
" " Green B	Magenta					"	"	"
" Olive R	Violet brown					Brown	Brown	Yellow
Indigo Pure K	Yellow olive slowly blue	Quickly colourless	Yellow orange	Lemon	Slowly yellower	Lemon	Lemon	Almost Colourless
" MLB/6B	Blue green	Almost unaltered				Orange yellow	Orange yellow	Pale yellowish
Ind. Blue 5G	Green	Duller	Green	Blue green		Blue	Blue	Blue
" " RK	Yellow olive	Yellow	Yellow	Blue		Dark	Brown	Blue
" " RS	"	"	Strong yellow	HNO_3 Part: blue		Blue	Blue	Blue
" " BC	"	Green yellow	Clear yellow	HNO_3 part: green		"	"	"
For Comparison.								
Indocarbon CL	Blue + HNO_3 = violet				Almost decolourised	Brown yellowish	yellowish	yellowish
Sulphur Black	Mostly slightly soluble & blackish		Clear black-grey	Decolourised	"	Mostly brown yellowish	Mostly yellowish	"
Hydron Blue	Slightly soluble blue black + HNO_3 = blue		Pale blue	"	"	Yellowish	Yellowish	"
Alizarin Red	Brownish red	Yellower	Orange yellow + $NaOH$ = violet	Unalter	Slowly yellower	Orange	Orange	

SINGLE DYESTUFF IDENTIFICATION OF THE VAT COLOURS

Additional reactions.

These supplement the fundamental reactions insofar as these are the same or similar for several dyestuffs, and also they characterise certain individual dyestuffs. They are also different from case to case and do not fall into a scheme. Below are some examples of their use and some of the other useful reagents or methods.

Differentiation of the Indigoid blues.

Glacial Acetic acid + 10% HNO_3
Dyeing treated for ½ minute.

		Solution
Alizarine Indigo		rather stable blue.
Indigo - not halogenated		quickly yellow
Indigo halogenated		blue ---- yellow
Indanthrene Printing Black B		blue ---- orange-brown
Piperidine - cold.	Indigo not halogenated.	blue-green solution.
	Indigo halogenated	orange-red-orange (then 4G almost yellowish-green)

Conc. H_2SO_4, H_2SO_4/KlO_3 H_2SO_4/HNO_3) leave standing, differentiate the non halogenated Indigo.

H_2SO_4 58° Be, Fibre warmed in Stannous chloride } Differentiation of the halogenated Indigo.

H_2SO_4/HNO_3, Fibre + HNO_3 }

	Ind. Red FBB	Ind. Rubin B	Ind. Bordeaux B
Acid leuco compound	Red	Red	Green
HNO_3 + little $NaNO_2$	Red orange	Yellow	Green

	Indanthrene Golden Yellow GK	Indanthrene Golden Yellow RK	Indanthrene Printing Yellow GOW
H_2SO_4 58° Be	Orange	Yellow	Yellow
Spectrum in Pyridine	Good	Displaced compared with GK RK and GOW rather alike.	
" " " + little NaOH (4%) warmed.		Slight differences.	

Differentiation of the Indanthrene Blues (H_2SO_4 Conc. Yellow Olive, HNO_3 spot yellow. Hydrosulphite blue).

	Fibre + HNO_3	HNO_3 spot	Fibre in $SnCl_2$ colour of the HNO_3 part.
Ind. Blue RS - Brill. Blue R	Pure yellow	Yellow	Full blue
" " 3G " " 3G	" "	"	" "
" " 3GF	" "	"	" "
" " GCD	" "	"	Green blue
" " BC, BCS	Remains tr. greener	Pale yellow	Green
" " GC	Pure yellow	" "	

Spot with diluted HNO_3 (50 cc. conc. HNO_3 + 30 cc. H_2O) for the differentiation of RS and 3G.

Spectrum of a rather conc. solution in conc. H_2SO_4; BC, BCS good; GC good, but displaced slightly compared with BC.

Reagents. H_2SO_4/KIO_3 = 1,000 cc. conc. H_2SO_4 + 6 gm. KIO_3
H_2SO_4/HNO_3 = 400 cc. conc. H_2SO_4 + 15 cc. conc. HNO_3
H_2SO_4 58° Be = 75% H_2SO_4
Stannous chloride = $SnCl_2$ crystals + conc. HCl + water (1:1:1)
H_2SO_4/Boric acid for spectrum = 5% Boric acid
otherwise = 10% " "

Further Convenient Additional Reactions & Methods.

Pyridine + NaOH (4%). Distinguishes Ind.Yellow RK from Cibanone Yellow RR
Indanthrene Brill.Violet RK, PBK=Green
Indigosol Brill.Green - I4G = Violet
Indanthrene Olive Green B - dyestuff=Red

Pyridine + water + Hydrosulphite, then + NH_3, then + NaOH
Distinguishes Indanthrene Yellow CK and 5GK.

Conc. H_2SO_4 to which is added 1 drop HNO_3, typical colour changes, e.g.
Indanthrene Red GG, Indanthrene Brilliant Green and Indocarbon CL dyestuffs, Hydron Blue.

Conc. H_2SO_4/Boric acid possibly warmed slightly, e.g., Ind.Orange 6RTK and 7RK Violet (+ 1 drop HNO_3 = Magenta Red)

Conc. H_2SO_4/HNO_3 for example distinguishes Indanthrene Olive 3G from Indanthrene Khaki GG (compare also acid leuco compound)
Indanthrene Brown NG fast blue.

Conc. HNO_3 in test tube, e.g., Ind. Olive T.
Conc. HNO_3 + H_2O_2 distinguishes Indanthrene Blue 5G, and Indanthrene Green BB.

Conc. HNO_3 + a little fuming nitric - Indanthrene Printing Blue R.

Conc. HCl and 20% HCl - Indanthrene Green 4G
Conc. H_2SO_4 then 75% H_2SO_4 added. Typical colour change, Indanthrene Brown 3GT from blue to red violet.

Conc. H_2SO_4 + H_2O 100:5 cc. Indanthrene Red Violet RH green solution (RRN red).

Conc. H_2SO_4 + H_2O 100:75 cc. distinguishes Indanthrene Brilliant Violets RK and BBK.

H_2SO_4/KIO_3 (see for Naphthol AS) } distinguish between
H_2SO_4 75% } Navy Blue & Dark Blue.

Stannous Chloride Solution.

Treated with alcohol, then + some stannous chloride solution in U.V.
(Hanover quartz-mercury lamps = U.V. lamp)
Indanthrene Brilliant Pink R Extra - yellow green fluorescence.
Indanthrene Scarlet B - violet fluorescence.

Vat poured on paper under U.V. lamp, Indanthrene Brown RRB.
Indanthrene Printing Brown R, yellow orange fluorescence.

Cold Piperidine solution: Indanthrene Brilliant Violets RK, BBK blue green;
Indanthrene Printing Violet BBF - orange yellow.
Cold Piperidine solution under U.V. lamp. Indanthrene Printing Violet BBF - orange yellow fluorescence.
Indigosol Printing Violet IRR green yellow.
Spectrum in Pyridine - distinguishes Indanthrene Brilliant Violet RR, 4R and 3B - Indanthrene Dark Blue BOA.
Spectrum in NaOH + Hydrosulphite solution - Indanthrene Navy Blue R.
Spectrum in H_2SO_4/Boric acid (5% Boric acid) - Distinguishes Indanthrene Blue 5G, and Indanthrene Green BB.
Spectrum in Conc. H_2SO_4 - Indanthrene Olive R.
Spectrum in Conc. H_2SO_4 then + 1 drop HNO_3 - Indanthrene Olive R.
Vat shaken up with ether then ether in the U.V. lamp.
Indanthrene Red 5GK - orange fluorescence.
Cibanone Red B - no fluorescence.

Separation Methods for Vat Colour Mixtures

Conc. HNO_3. Dyestuffs which are soluble in conc. HNO_3 are separated by the HNO_3 spot (see fundamental reactions) from dyestuffs which are insoluble in HNO_3. Therefore, further reactions can be done on the spot for identification. If several dyestuffs bleed off, then possibly a more dilute HNO_3 or possibly also HCl can be used. By repeated extractions of the dyeing with HNO_3 the dyestuffs insoluble in nitric acid are occasionally left on the fibre in a suitable condition for their isolation.

Strong Soaping Test against white cotton removes individual dyestuffs, e.g., Ind. Yellow G, Indanthrene Red GG and in part Indigoid Reds, Indigoid Blues and Blacks. In a similar manner individual dyestuffs can be vatted off with a -

Weak Reducing Agent, e.g., Na_2S + possibly a little pyridine.

Hydrosulphite + 4% NaOH. By repeated treatment many dyestuffs may be completely removed, whereas others remain on the fibre. To vary this, fibres may be left in caustic and hydrosulphite at 80° for a longer period, or NaOH of other concentrations may be used.

Hydrosulphite in Water, without alkali, possibly with or without pyridine.

Strong Bleach. The fibres, possibly first moistened with a little pyridine, a little water added and warmed. Dyestuffs not fast to chlorine are decolourised in varying degree. Indanthrene Blue 5G, Indanthrene Brilliant Violets RK, BBK, Indigoid Blues and Blacks.

Bleach + Acid destroys many dyestuffs, many are only changed to yellow.

Permanganic Acid ($KMnO_4$ + Acid) destroys for example, Indanthrene Brilliant Green, Ind. Brilliant Violet, while many yellow dyestuffs are more or less stable.

Pyridine or Piperidine + H_2O + Hydrosulphite. Many dyestuffs remain on the fibre (Ind. Yellow 3RT, Ind. Golden Orange 3G, Ind. Red FBB, Indanthrene Scarlet R, Aniline Black) Others are completely removed (Ind. Scarlet B, Indanthrene Blue 5G, Ind. Red Brown 5RF, etc.).

Separation with Orangic Solvents. Glacial acetic acid, Pyridine, then Glacial acetic acid; Alcohol then Glacial acetic acid, etc..

Conc. HNO_3 + Hydrogen Peroxide destroys, for example, the Indanthrene Blue 8GK dyestuffs.

The choice of method of separation depends on the dyestuffs present and emphasises the importance of experience in the use of the fundamental reactions.

Identification of Single Dyestuffs of the Naphthol AS Group

The dyestuffs of the yellow and brown naphthol series AS-SR, AS-SG, AS-GR are not yet included analytically in a system. They are identified individually (Reagents as for the rest of the Naphthol AS series). By spotting with HNO_3 many AS-G dyestuffs become greenish, and dyestuffs of the other yellow naphthols become orange. On shade grounds these Naphthol AS dyestuffs are mostly well distinguished from the following.

The other, approximately 700, dyestuffs from the Naphthols AS, AS-BS, BO, BR, BG, TR, D, RL, SW, OL, E, LT, ITR, LC, S, can be fitted in to a system. Dyestuffs prepared from one and the same base (independantly of which Naphthol, the base is coupled with) give with certain reagents almost the same colour change. These colour changes are different from base to base, and the base is first determined by means of these "Base Reactions" (see Tables on pages 13 and 14). This summary is subdivided into a "Red Group" (Table on page 13) and into a "Special Group" (Table on page 14). In the use of Absorption spectra these must be accurately compared. Then follows the identification of the Naphthols. There are few Naphthol reactions, and the colour changes obtained with them are sometimes also dependant on the base. It is not possible, therefore, to set down a system, but the reactions and technique used are set out on page 15. Careful comparisons are necessary especially with the H_2SO_4/KlO_3 reagent since the colour changes are transient. The approximately 15 dyestuffs of one base with different Naphthols can, however, be distinguished in part by the shade.

NAPHTHOL AS - RED GROUP BASE IDENTIFICATION

Red Group comprises the oranges, reds to bordeaux dyestuffs insofar as they become red, red violet, violet or blue with concentrated H_2SO_4. The limit of the concentrated H_2SO_4 in the reaction of Fast Bordeaux GP.

	Conc. H_2SO_4	Pyridine + some % naOH	Fibres treated hot with conc. NaOH, Na_2S about 2 min. Sometimes moistened with pyridine. Fibres washed off.		
Fast Bordeaux BO	Greenish blue		Almost unaltered	H_2SO_4/Boric Acid - green blue	
" Red RC	Pure Blue		" "	Quickly gold yellow	
" Red FR	Violet blue		" "	H_2SO_4/HNO_3 red, slowly yellow	Different spectrum in Conc. H_2SO_4
" Red FG	" "		" "	H_2SO_4/HNO_3 " " "	
" Red GTR	Dark violet		Mostly little bluer	Scarlet RC is similar	
" Scarlet LG	Going redder		" "	HNO_3 bleed typical with AS.ITR	
" Red ITR			Almost unaltered		
" Scarlet GC	Violet magenta	Much bluer (violet)	" "		
" Red TR	Going redder		" "	H_2SO_4/HNO_3 in basin. lemon yellow	
" Red RBE			Mostly little bluer	H_2SO_4/HNO_3- soon yellower	
" Red KB		All less typical (Somewhat bluer, (somewhat redder)	Almost unaltered		
" Orange RD	(Violet)magenta		" "		
" Scarlet TR	Magenta		" "		
" Yellow CC	Going redder		" "		
" Orange GC	" "		" "		
" Orange GCD			Mostly somewhat bluer		
" Gold Orange GR	Red violet		" " "	Warm with 4% NaOH - red violet Hydrosulphite + NaOH - Fibre at first redder.	
" Scarlet RC	Blue violet		Much bluer	Beware Fast Scarlet LG (see above).	
" Orange LG	Red violet		" "	Different spectra in Conc. H_2SO_4	
" Scarlet G	" "		" "		
" Orange R	" "				
" Red RL	Magenta red	Blue		Different H_2SO_4 66/HNO_3 Solution A	
" Red GG	" "	" a group			
" Red B	Violet blue	"			
" Orange GR	Magenta red	Clear blue violet	Decolourised a	Different - trace redder	
" Red GL	(bl)Violet	" " "	"	H_2SO_4/HBO_3 - trace bluer	
" Red 5GL	" "	" " "	" group		
" Bordeaux GP	Blue	" " "	"	Hydrosulphite + NaOH = Orange.	
" Red AL	(bl)Violet	" " "			

BASES FROM FAST RED GTR TO FAST ORANGE GCD

In addition to the reactions given some measure of differentiation is given by the Spectra which are placed one after another and should be compared:

(1) Concentrated H_2SO_4
(2) " H_2SO_4 then some H_2SO_4/HBO_3 added to it.
(3) To (2) add some H_2SO_4/HNO_3
(4) Concentrated H_2SO_4, then add some H_2SO_4/HNO_3.

REAGENTS.

H_2SO_4/HNO_3 / H_2SO_4/HNO_3 Solution A = Concentrated H_2SO_4 400 cc. + concentrated HNO_3 15 cc.

H_2SO_4/Boric Acid for Spectra = Concentrated H_2SO_4 + 5% Boric Acid.

H_2SO_4/Boric Acid otherwise = Concentrated H_2SO_4 + 10% Boric Acid.

Concentrated NaOH + Na_2S = 100 gm. NaOH 65° Tw.
+ 62 gm. Na_2S Cryst.
+ 18 cc. H_2O

NAPHTHOL AS - Special Group

The Special Group includes:
Of Red Tones - no pure red, but only bordeaux reds and those which in conc. H_2SO_4 give green-blue or green. The Corinth violets, blue or dark blue shades of these dyestuffs, which give blue, green blue, or green in conc. H_2SO_4. Also Fast Violet B, Fast Corinth B (Conc. H_2SO_4 Violet Blue) and the Variamine Blue group (Conc. H_2SO_4 - red or violet) Pyridine + NaOH ---> red. Also the Brown Bases, which react typically in conc. H_2SO_4 and Pyridine + caustic.

	Concentrated H_2SO_4	Exceptions	Pyridine ---> then + 4% NaOH		
		SW - blue	Violet	Intense blue	Different with H_2SO_4/HNO_3 (400 cc. : 15 cc.)
Fast Corinth V	Bright green	BG blue ---> violet blue	Magenta	Intense violet blue	
" Garnet GC	" "	BG slowly bluer	"	" " "	
" " GBC	" "	BG slowly bluer		Somewhat redder BR. ITR only tr. redder almost unchanged (duller & bluer)	Different with H_2SO_4/HNO_3 (800 cc. : 5 cc.)
" Blue B	" "				
" Corinth B	Green blue	BR = Violet blue			
" Black G	Slowly blackish blue	ITR = violet black SW, BG, LC, slowly violet black		much redder	
" Dark Blue R	Bright green			Stronger & greener	Different with H_2SO_4/HNO_3 (400:15)
" Black K	(blue) green	SW soon violet black BG slowly violet black		" " "	
" " LB	(blue) green	LC slowly almost blue		" " "	
" Blue BB	" "			Intense magenta red	H_2SO_4/HNO_3 (400:15) and HNO_3 bleed typical, although no difference with it.
" " RR	" "			" " "	
" Violet B	(violet) blue			Much redder (scarlet)	Different with H_2SO_4/HNO_3 (400:15)
" Corinth LB	" "			Little bluer and duller	HNO_3 bleed typical
Variamine Blue B	Red			Intense red	Different with Conc. H_2SO_4 + Ferric Sulphate (500 cc. + 0.5gm)
" " RT	"			" "	HNO_3 bleed typical.
" " FG	Dull violet			" "	HNO_3 bleed typical
Fast Brown V	Difficulty soluble olive brown			Strong olive green ---> duller blue green	
" " RR	Intense magenta			Much yellower red (almost wine red)	

IDENTIFICATION OF THE NAPHTHOL COMPONENTS FOR THE RED AND SPECIAL GROUPS

This follows, after the base is determined, by comparison with the dyestuffs of this base in general with the following reagents:-

(1) Conc. H_2SO_4 + KlO_3 - 1,000 cc. + 6 gm. KlO_3 (Stable) Reagent for AS-BR, AS, AS-LC, AS-BG, AS-S.

(2) Conc. H_2SO_4 + H_2O_2 - 30 cc. + 3.5 cc. H_2O_2(15%)

(3) Fibre spotted with conc. HNO_3, and pressed on filter paper, AS.ITR, often distinguishable.

(4) Conc. H_2SO_4 + H_3PO_3 - 30 cc. conc. H_2SO_4 + 10 cc. phosphoric acid (23%).

(5) H_2SO_4 + KlO_3 + fumaric acid - 15 cc. H_2SO_4/KlO_3 + fumaric acid.

(6) H_2SO_4 + KlO_3 + Maleic acid - 15 cc. H_2SO_4/KlO_3 + maleic acid.

(7) H_2SO_4 + Boric acid + KlO_3 - 15 cc. conc. H_2SO_4/KlO_3 + about 15 cc. H_2SO_4 + 10% boric acid.

(8) H_2SO_4 75%

(9) Treat with glacial acetic acid, then add a little stannous chloride.

(10) Crystallisation (usually glacial acetic acid) (occasionally also pyridine).

Reagents 2, 4, 5 and 6 are frequently freshly made up since they are of limited stability.