

XXXV.—*Researches in Dyeing. Part II. Note on the Emission of Colouring Matter.*

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XI. The experiments to which we are about to refer were performed in a manner precisely similar to that described in Part I (*Chem. Soc. J.*, 1879, **1**, p. 26). The colouring matter selected was a sample of Nicholson's blue, well crystallised, and several years old.

Each experimental "vat" contained 0.2780 gram of pure silk ribbon, and 0.0100 gram of Nicholson's blue in 400 c.c. of water. A blank set (A) of five vats was wholly constituted thus: a second set (B) contained, in addition, 1 gram of potassic chloride in each vat; and the third set (C) contained, as its addition, 1 gram of sodic chloride in each vat. The sets and individual vats were marked respectively A₀*, A₁, A₂, A₃, A₄; B₁, B₂, B₃, B₄; C₁, C₂, C₃, C₄. After 24 hours' contact, the silk was withdrawn from A₁, B₁, C₁; after 48 hours, from A₂, B₂, C₂, &c., &c.; and during half of each daily period, temperature observations were made. The residual colouring matter in each vat was determined by means of the portable colorimeter, that which had been left unexhausted in A₀ being regarded as 100. The results are comprised in the following table:—

	A ₀ .	A ₁ .	A ₂ .	A ₃ .	A ₄ .
(A.)	100.0	95.6	92.6	87.1	97.6
		B ₁ .	B ₂ .	B ₃ .	B ₄ .
(B.)	—	78.8	68.7	83.5	99.7
		C ₁ .	C ₂ .	C ₃ .	C ₄ .
(C.)	—	93.2	78.3	72.4	68.9
Day temp.		11.3°	12.8°	11.7°	11.4°

The extremes of day temperature were 11° and 13°.5.

* This vat contained no silk.

XII. The numerical results in [A] and [B] are not amenable to treatment; those in [C] correspond to an equation—

$$y = 98.2(0.912)^x,$$

with a probable error of 1.9 per observation. This probable error is not unduly large, if we bear in mind the method of estimation, and the peculiar difficulties which attend the observation of the tints of the blue substance employed.

XIII. The experiments in [A] and [B] show a very remarkable phenomenon. The energy of combination between the silk and the colouring-matter has been over-developed at first, and the excess of deposit thus taken up has been emitted gradually during the third and fourth days. It is noteworthy that, while this result is well marked in the case of water, it is much more decided when potassic chloride is present, and is wholly prevented by the addition of sodic chloride. A fundamental difference of this kind between these two chlorides is only very rarely encountered. The emission of colouring matter, in some cases, has been previously observed; but we believe our own measurements of it to be the first that have been made.

A solution of 0.009 gram of Nicholson's blue in a litre of water lost much of its colour on boiling, and much more when slowly cooled somewhat below that temperature; a little hydric acetate soon causes the colour to return. The original liquid is instantly bleached by a mere trace of alkali.

XIV. If a solution of the blue be diluted with a considerable amount of water it becomes paler at first, but dark again on long standing. We at one time supposed that we were in fact making measurements of this restored tint in our vats A and B; but the still greater dilution in C, without this restoration occurring at all, convinced us subsequently that we were really dealing with the forcible emission of colouring matter. Moreover, the dilution in our vats proved insufficient to produce any material effect of this kind, though it may possibly have somewhat hampered the colorimetric estimations. In these we were careful to make successive approximations to equality of strength in the comparison tubes, and, as far as could be done, to measure dilutions of equal age.

XV. With regard to the disputed question, whether silk can or cannot be dyed with this peculiar blue, we unhesitatingly express the opinion that a real and uniform dyeing effect is always obtained; this is well seen in our experiments C. The heat and "souring" to which dyers usually have recourse are operations quite apart from the intrinsic deposition of the pigment.

XVI. So far as practical considerations are concerned, we think it advisable not to maintain this blue so long as is usually done at the

dissoçiation temperature; silk or wool, in such a case, has to work under adverse conditions. Much, also, is to be hoped from the employment of common salt in the vat. It sustains with uniformity the essential dyeing effect, prevents the emission of colour, and thus furnishes a curve without reversal.
