VI.—*Use of the Sulpho-Purpuric Acid, (or Red Sulphate of Indigo,) in the Dyeing of Worsted and Silk.*

By Mr. Edward Haeffely, of Mulhouse.

[*Read December 14th*, 1852.]

I take the liberty of drawing the attention of the Society to a new fact, demonstrated in the successful application on worsted and silk of the red sulphate of indigo, (the phenicine of Mr. Walter Crum.)

This chemical compound is produced by the action of sulphuric acid upon indigo, and by throwing the mixture thus obtained into a large quantity of water a few minutes after the contact. By this means a red-coloured precipitate is formed, which, when well and thoroughly washed on a filter, represents the red compound in question, a very different production from the blue sulphate of indigo in its composition, properties, and as regards the shades produced by it.

I have been able to produce with this red sulphate of indigo, shades superior in all respects to those obtained by the employment of the indigo extract, imitating the prussian blue, and likewise purple shades bearing an imitation of those produced by the use of logwood and cudbear, which shades, I should observe, cannot be produced from the commercial indigo "carmine;" I have been induced therefore to communicate the results of the experiments I have made in this matter, and at the same time I have the

honour of exhibiting for inspection some patterns, the results of the putting into operation of both processes, so that the difference between the two may be fairly estimated. I may be permitted to say that I have not the least doubt that after a careful examination of these patterns, every one will be inclined to give a preference to the blue and purple colours obtained by the use of the red sulphate, which has been introduced into commerce, and applied by dyers with success, in some dyeing establishments of the neighbouring county of York.

I will now enter into a few details respecting the chemical nature of these two sulphates. Upon an examination of the formulæ of the two chemical bodies referred to, it will be found that the ordinary indigo extract is, properly speaking, a hypo-sulphate of dehydrogenised indigo

$$= S^2 O^5 + N C^{16} H^4 O^2,$$

(The formula of the indigotine being—

$$N C^{16} H^5 O^2,)$$

whilst the red compound is a sulphate of indigotine—

$$S O^3 . H O + N C^{16} H^5 O^2.$$

Upon a comparison of these two formulæ, it will be remarked that in the case of the indigo extract, the indigo and the sulphuric acid have undergone remarkable alterations: the indigo having lost a portion of its hydrogen, and the sulphuric acid a portion of its oxygen,—and these two elements, hydrogen and oxygen, having united to form water. But in the case of the red sulphate, the indigo and the sulphuric acid have entered into combination *without* undergoing any change.

As in the composition of the red sulphate the colouring matter is "or appears" *unaltered*, I was induced to entertain the supposition that it might be beneficially used in dyeing, for obtaining solid blues directly, an operation which might probably replace with advantage the process of obtaining blues from vats.

A circumstance which is in favour of the possibility of fixing this colouring matter on fabrics in a state of indigotine is, that some organic substances (such as sulpho-vinic acid, sulpho-glyceric acid, and other sulpho-acids) possess the property of being decomposed and resolving themselves into their primitive constituents by a simple ebullition in water.

This red sulphate of indigo may be ranked in that type of organic bodies, where it figures under the name of *Sulpho-purpuric Acid.* As it ought to partake of the properties of the series of compounds mentioned, it should necessarily, on its ebullition in water, decompose itself into *free indigo* on one side, and into *free* sulphuric acid on the other. Consequently I presumed that by introducing fabrics into the vessel where the process was going on, and at the moment of the separation of the colouring matter, I could fix this colour upon the fabrics so introduced.

But the first experiment I made did not turn out to be satisfactory. Cotton remained untouched by the colour, whilst the worsted took off and successfully retained the colouring matter. I made three consecutive trials on the occasion; the first in a neutral bath, the second in an acid bath, and the third in an alkaline one; but in all the three cases, so far as the cotton was concerned, there was no successful result. Hence it appears that the cotton has no affinity for this indigo. But silk and worsted may be effectually dyed in the way I have indicated, if the bath be only kept acid.

As I have already observed, some of these patterns imitate the prussian blue, and those washed in soap or alkaline water resemble the purple produced from logwood and cudbear, which shades could not, up to the present time, be produced by the employment of indigo alone.

A question which it will now be worth while particularly to inquire into is this—whether the indigo appears *on these fabrics* as indigotine, or as sulpho-purpuric acid, or as a modification of this acid.

I incline to the opinion that it is a modification of indigotine, or of the acid colouring substance; for I found that this sulpho-purpuric acid, in contrariety to the opinion generally entertained, is an intense red-coloured compound WHEN DRY, and not an intense blue one.

Nevertheless, upon examining the patterns dyed with this *red compound*, it will be found that they *are blue on these fabrics*, and *not red;* and those patterns passed through alkali *are purple*,—an effect which is not produced by indigotine.

I have not yet completely solved this question, and for the present only take the liberty of calling attention to the new shades obtained by the employment, in the dyeing process, of this sulpho-purpuric acid, viz., the blue, imitating prussian blue, and the indigo purple, imitating the shades obtained by the use of logwood.