

ART. XLVII.—*Observations on the color of Fluorescent solutions*—No. II; by HENRY MORTON, Ph.D., President of the Stevens Institute of Technology.

SINCE the publication of my article on the above subject, in the August number of this Journal, I have discovered a curious action which, while it in no respect affects my general conclusions, nor the main observations on which they were founded, throws out one of the corroborative experiments by which I thought that they might be established when a spectroscope was not at hand.

Obtaining some very anomalous results of late, I was led to mistrust the action of the Geissler tubes in which the solutions had been examined.

They were of the ordinary kind of jacketed spirals, selected as being nearly identical in size and other particulars.

It had been observed from the first that the internal spiral gave a faint blue fluorescence which could only be seen on close inspection; and in all cases, the tube being but partly filled, it was considered that a light appearing in the part covered by the fluid, many times more bright than that from the uncovered part of the spiral, was sufficient evidence of fluorescence in the liquid.

Late experiments have, however, proved that this was not so. Any liquid, however devoid of fluorescent properties, gives all the appearance of fluorescing in these tubes, and on a little thought the cause of this became clear.

The only fluorescent light that can be seen from the glass of the spiral is that which comes off tangentially from the outer surface, that emitted radially being marked by the bright electric discharge behind.

In passing from the glass to air, most of the light will suffer total reflection at the outer surface of the glass, but if water or

any other liquid is substituted for the air, its greater refracting power (approaching that of glass) will diminish the above named action, so that much more of the light will reach the eye. The truth of this explanation was supported by the observation that the nearer the index of refraction in the liquid came to that of glass, the brighter was the light seen through it, while a liquid of higher refraction, like carbon bisulphide, seemed a little to weaken the effect by diffusion.

This fact renders of no account the observations before made on filtered and diluted solutions of turmeric, but a fresh observation with the spectroscope on tubes free from fluorescence has fully confirmed my former conclusions as to the true color of fluorescence in this liquid.

No correction need be applied to the description already published in the case of the asphalt solution, but I may add to what was there stated another striking example.

If one of the little Geissler tubes containing nitrogen, called "spectrum tubes," be jacketed by means of a perforated cork and a large glass tube, and the jacket filled with pure or non-fluorescent benzine, then illuminating the tube, and with a pipette dropping in that petroleum product called "cosmoline" (a lubricating oil made by E. H. Houghton, of Philadelphia), each drop will appear of a rich blue as it dissolves in the benzine, which soon acquires a magnificent blue fluorescence. Increasing, however, the quantity of cosmoline oil until its color begins to take effect, the tint of the fluorescence gradually changes to a rich green.

By a little care a blue solution may be superposed on a green one in the same tube.

Another semi-solid preparation of cosmoline, which has a very light color, gives a solution with benzine fluorescing of a magnificent blue.

I have this substance now under investigation, and hope soon to be able to make some further observations upon it.*

Returning to the solutions of turmeric, I have found that the fluorescent body in that substance is not its essential oil nor its brown coloring matter, but either the yellow coloring matter itself, or something so closely allied to it in solubility that I have thus far been unable to effect any separation.

In connection with this, let me say that I am much indebted to Mr. Robt. F. Fairthorne, of Philadelphia, who has aided me greatly in the preparation of the various constituents of turmeric in a state of purity.

In my former paper I mentioned that uranium nitrate in solution gave a very faint fluorescence.

* Mr. Houghton tells me that "cosmoline" is prepared from crude petroleum by evaporation in vacuo and filtration through animal charcoal only, without any chemical treatment.

This appearance I now find was due entirely to the above explained action of the tube, and a number of carefully conducted observations now convince me that this substance, while it fluoresces so vividly in the solid state, loses that property entirely when in solution.

I have also found that a saturated solution of acid quinine sulphate has its fluorescence much *increased* by dilution.

Lastly, let me remark that I by no means assert that *all* solutions fluoresce blue, but simply those which I have examined. There are many which I have as yet been unable to procure or study, whose relations in this respect I hope soon to investigate.